APRIL 8, 1957
50 CENTS

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Industry fights renegotiation on principle . . . . . Page 34
Engineering employment survey . . . . . Page 53

AMERICAN AVIATION

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•

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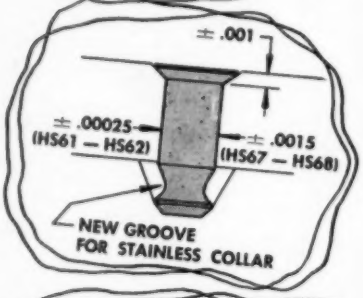

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APRIL 8, 1957 — VOL. 20, NO. 23

AMERICAN AVIATION

WORLD'S LARGEST AVIATION PUBLISHERS

Navy's flying radar watch over Atlantic

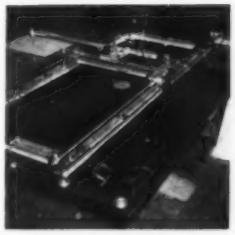
WV-2 picket planes are flying an average of 3.7 missions daily in all kinds of weather to prevent a surprise attack. Details Page 43.

New life has been breathed into blimps

Mach 2-minded policy-makers have had to revamp their thinking to make room for Navy's family of airship weapons. Page 46.

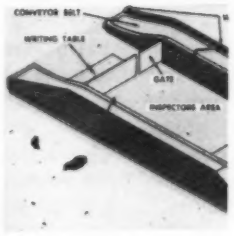
Computers learn from an electric tank

A French research device gives engineers experimental foundations for their theoretical reasoning. For an analysis see Page 48.



Customs new supermarket passenger operation

When the jets come, you'll be expedited through ports of entry by new methods now about ready for Idlewild. See Page 83.



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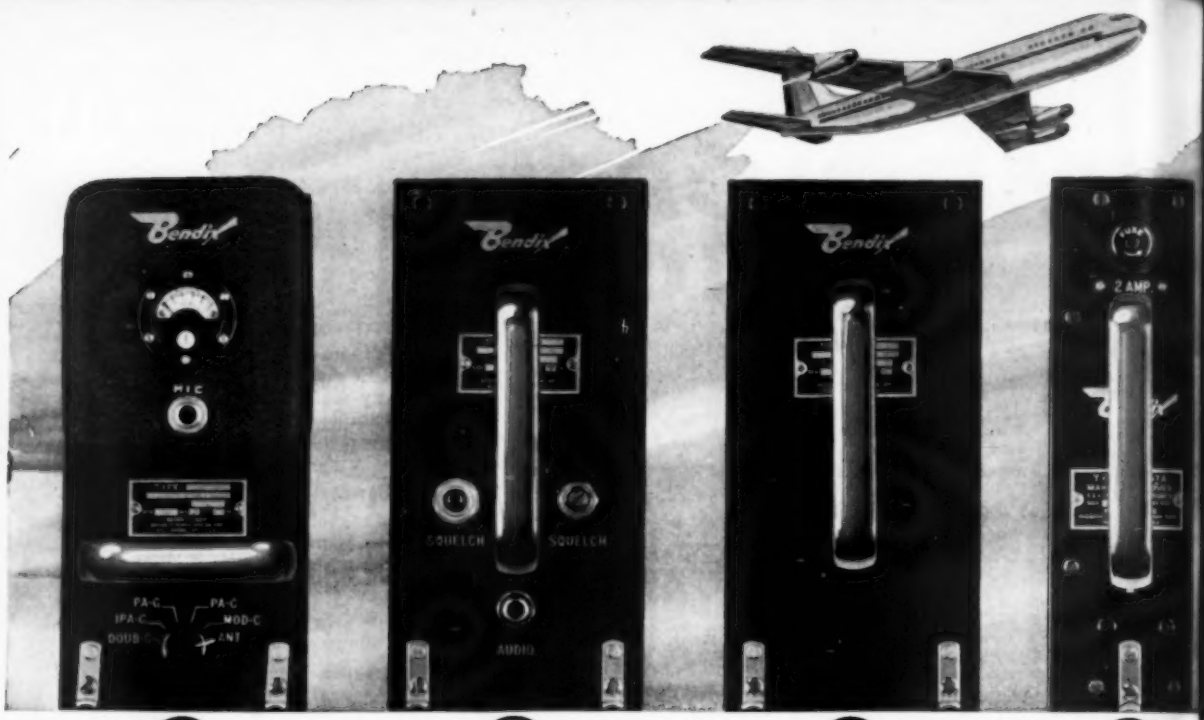
59,200 Copies of This Issue Printed.

Exclusive in the NEW American Aviation . . . The modern easy-to-read format of the NEW American Aviation is a fitting showcase for the many outstanding articles in this issue. Learn the truth about Sonic Boom damage: claim-conscious citizens think they can collect easy money, but 'damage' usually is doubtful, Page 31; what renegotiation is doing to the aircraft industry, Page 34; how Kellett plans greater stability for helicopters, Page 40; what Customs is doing to expedite jet passengers at ports of entry, Page 83.



1

TA-21A VHF TRANSMITTER—Companion unit for RA-21A VHF Receiver. Reliability increased by new, improved circuitry, use of printed wiring and transistorized power supply. Power requirements reduced. Short ⅜ ATR; 360 channels; 50 KC spacing. Complete unit remote controlled. 25 watts output.

2

RA-21A VHF RECEIVER—Designed as companion unit for TA-21A VHF Transmitter to provide complete VHF communications. When used with the NVA-21A Navigation Unit, it provides complete VOR/LOC navigation. Short ⅜ ATR, 360 ch., 50 KC spacing, transistorized power supply, printed wiring, remote control.

3

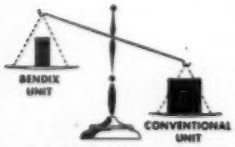
NVA-21A NAVIGATION UNIT—For use with RA-21A VHF Receiver to provide complete VOR/LOC course information. Completely transistorized. Incorporates in single package all required audio and instrument circuits for complete automatic VOR/LOC instrumentation. Short ⅜ ATR. Facilities provided for (a) Tone Localizer, (b) Manual Omni-Range, (c) Automatic Omni-Range.

4

MKA-7A MARKER RECEIVER—½ ATR single-channel navigation receiver for reception of beacon signals from airway fan markers, station locator Z markers and ILS approach markers. Improved circuitry eliminates any possible erroneous signal lamp indications due to TV and FM interference.

NEW LIGHTWEIGHT NAV/COM SYSTEMS

New Bendix Equipment Meets Requirements of Latest Jet and Turbo-Prop Airliners and Virtually All Business-Type Aircraft.*



The growing complexity of jet-age aircraft, together with ever-increasing demands for improved performance and lower operating costs have introduced a number of perplexing problems for designers of airborne communications and navigation systems. Available space and permissible weight allowances have shrunk. Needs for improved performance, reliability and dependability have increased. A growing fleet of business-type aircraft, plus increased traffic problems have created a pressing need for communications and navigation equipment of true airline quality for *all* types of commercial aircraft. Not only the commercial transports, but the business types as well.

Bendix' new lightweight navigation and communications systems fill these exacting requirements. Units are lighter and smaller. Designed to fit neatly and compactly into the biggest transport or the smallest executive-type twin. Complete packages, if desired, to meet your particular requirements. Yet flexible. For the most part these new units are interchangeable and can be integrated with the time-tested and dependable Bendix systems now in

5

GSA-8A GLIDE SLOPE RECEIVER—20-channel, UHF Receiver. When combined with NVA-21A VOR Navigation Unit, provides complete ILS receiving facilities. New audio circuits assure higher degree of course stability and more reliable flag alarm information. Entire unit, including either AC or DC (transistorized) power supply, is housed in short ½ ATR case.

6

DFA-70 AUTOMATIC DIRECTION FINDER—½ ATR. Covers all frequencies from 90 to 1750 KC. Provides both visual and aural navigation information, including narrow-band consol reception. Electrical tuning eliminates tach shafts, permits control panel to be located as far as 50 feet from receiver. Increased operating range, higher sensitivity, greater accuracy.

7

AMA-10A PASSENGER ADDRESS AMPLIFIER—Complete transistorization and modular construction. Three input circuits are provided: carbon microphone, dynamic microphone and tape recorder. Maximum of 5 individually controlled plug-in type amplifier modules permit compensation for differences in noise levels in passenger compartment for "customized" performance during in-flight and on-ground operation. Short ¼ ATR.

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use in a wide variety of aircraft all over the world.

Examine some of the new communications and navigation aids described on these pages. See how improved design, improved circuitry and transistorization plus improved packaging are combined to give you lighter and more compact installations—with improved performance and reliability. For further information and complete specifications write to Bendix Radio Division, Aviation Electronic Products, Baltimore 4, Maryland. Or West Coast—10500 Magnolia Blvd., N. Hollywood, Calif.; Export—Bendix International Division, 205 East 42nd Street, New York 17, N. Y.; Canada—Computing Devices of Canada Limited, P.O. Box 508, Ottawa, Ontario.

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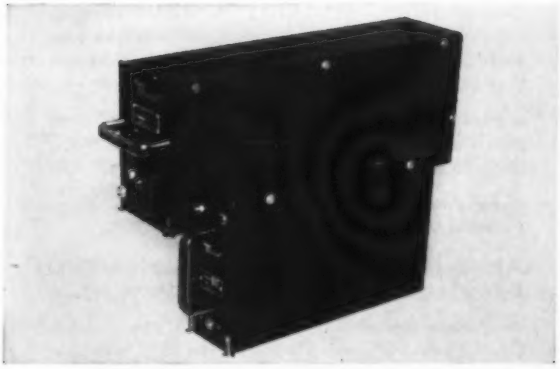
ATTENTION ENGINEERS: Our expanding commercial aviation programs in airborne navigation, communications and radar have created a need for qualified electronics engineers, particularly those having five to eight years' experience. We invite your inquiry.



Scope of size and weight reductions in new Bendix NAV/COM Systems is illustrated above. Upper left is standard ½ ATR unit; lower right, new compact, lightweight, short ⅜ ATR unit.

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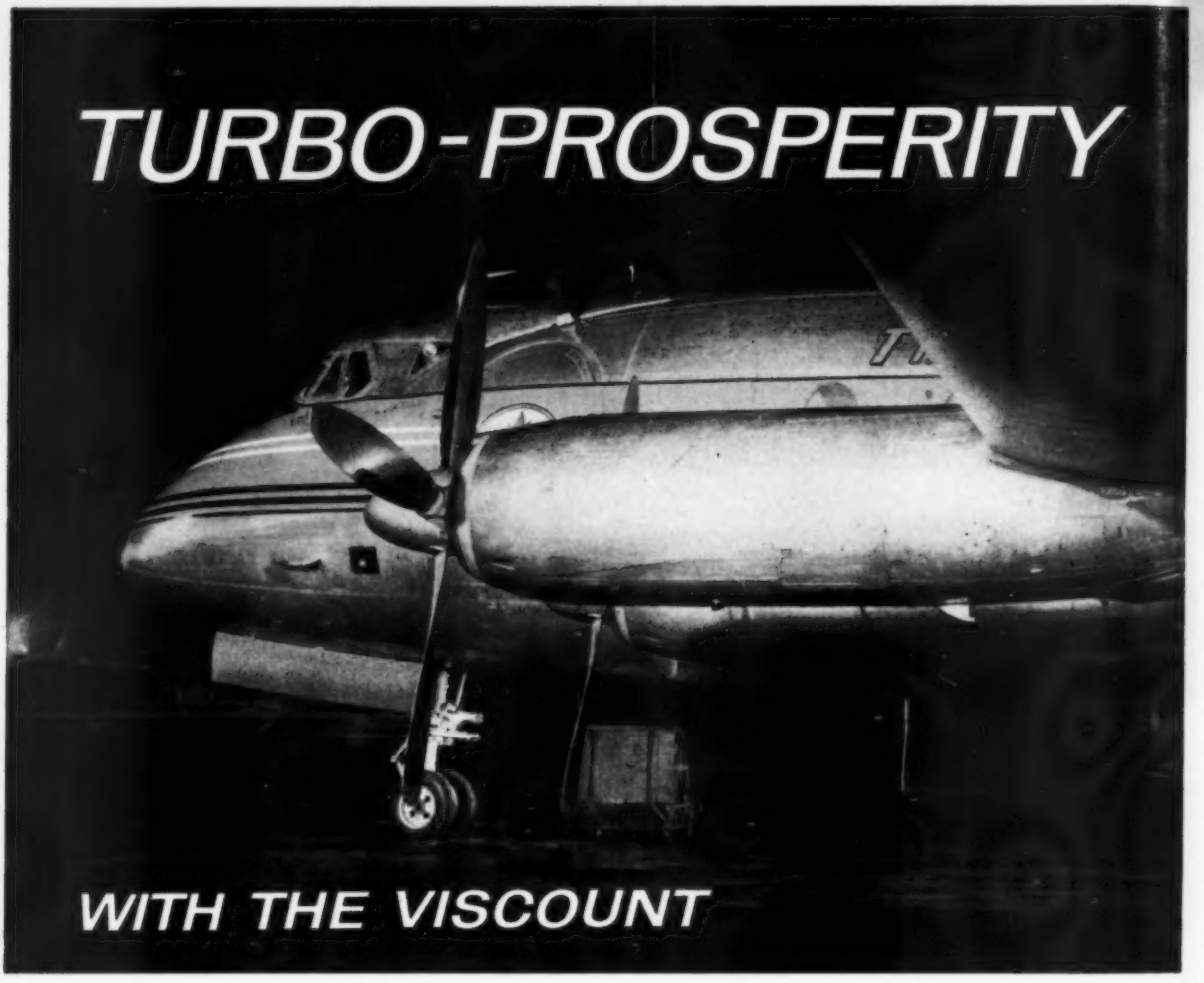

WITH THE VISCOUNT

Trans-Canada Air Lines' average passenger load factor rose to a record high of 84%.

Capital Airlines has flown over 20 million Viscount miles since July, 1955, enjoying unprecedented passenger acceptance, in many of America's most important and competitive airline markets.

British European Airways made $3,180,000 clear profit in 1955/56 at a rate of $68 per revenue flying hour. Utilization per Viscount was 2,347 hours.

Cubana reported a 119% increase in Havana-Miami traffic in three months at a load factor of 75%.

B.W.I.A. averaged 97% load factor on the New York-Bermuda route for the first three months of service.

Air France increased its traffic share of the competitive London-Paris route from 38% to 52%; averaged traffic increases of 25% to 30% on all turbo-prop routes and averaged 80% passenger load factor.

Trans-Australia Airlines achieved in 1955/56 an average passenger load factor of 86.1% and a daily aircraft utilization of 8.96 hours which "contributed materially" to a line profit of $846,000.

Vickers Viscounts have been ordered by over 30 airlines and are in service with 14. Thirteen Viscount customer airlines have placed reorders for the aircraft.

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Circle No. 5 on Reader Service Card.

Is Air Freight on the Way Up?

WHEN IS air freight going to start fulfilling all of the rosy predictions made for it ten years ago? There are indications that the time is nearing when this much-neglected part of the air transport business will begin showing impressive gains.

The key to a really big expansion will be the all-up mail service when Congress finally gets around to approving it. The Post Office would like to have Congress okay a five-cent letter rate and eliminate the separate airmail stamp, but chances of adoption this year are not overly bright.

But all-first-class-mail-by-air, whenever and wherever air is the fastest means of transport, is coming. Although the railroads are battling any such development the truth is that the rails are no longer able to provide the service. We heard the other day an estimate that rail schedules for the postal service have decreased from about 30,000 to 2,100 within the past quarter of a century.

The United States is one of the few countries of the world depriving its people of mail dispatch by the fastest means. The airmail stamp is obsolete.

The all-mail-by-air scheme would be an enormous boon to operators and manufacturers. Because a great many separate mail schedules would have to be operated, the capacity would be at hand to enter the air freight market in a substantial way. Aided by a service mail pay—which in itself would amount to some hundreds of millions annually for the industry—a lower ton-mile rate could be offered for freight, perhaps in the 10¢ to 12¢ per ton-mile bracket which would be attractive to thousands of shippers.

Passenger traffic doubtless will continue to increase at about 10% a year. But air cargo can leap up at 20% a year with any impetus at all.

Air freight experts believe the last six months of 1956 saw the best tangible gains in air freight for a long time. American Airlines, notably, and United to only a slightly less extent, produced some hefty gains in the last six months over the first half of the year. After a slow start, Slick began moving up steadily in the last half. So did The Flying Tiger Line although it is difficult to separate its passenger charter traffic from the purely freight figures.

Is air freight finally moving upward? Our own forecast is that by 1960 it will have leaped up impressively. The airline that is discounting the future of air freight will be lost in the shuffle.

Give It Some Help

THE OTHER day we were talking with Russ Nichols about model airplane flying. Russ is executive director of the Academy of Model Aeronautics (1025 Connecticut Avenue, N.W., Washington, D. C.).

We had our eyes opened. Frankly, we have never paid much attention to model airplanes, and we suspect this state of mind is true with a lot of industry people. But model airplane building and flying is no kid stuff, especially these days. Not only are many active members older in life and working in industry, but many younger members step from airplane building into aeronautical engineering.

We think those companies not now doing so should pitch in and give a lift to this worthy activity. The need for engineers is as great as ever and the Academy is one good means of creating interest. The Navy has been far-sighted in being an active help to the Academy. So has Pan American Airways, as Dallas Sherman informed us recently. Both aircraft manufacturers and airlines should look into the Academy work and they'll discover that here is a built-in ladder for much-needed engineers and other technical help.

Keeping a Name

THERE HAVE BEEN many purchases and mergers of component and electronic firms of late but one which caught our interest particularly was the reorganization of Air Associates, Inc. into a new firm called Electronic Communications, Inc.

We have no doubt that the change of emphasis is in tune with the market and the time, but we were pleased to note that the name of Air Associates will be retained as a subsidiary. Few aviation names around the world are as well known as Air Associates. We would feel sad indeed if it were to disappear as an entity.

Orchids

TO HUMPHREY W. TOOMEY, v.p. of Pan American World Airways in Rio de Janeiro, for receiving his fourth honor from the Brazilian government, this time the Santos Dumont Silver Medal . . . To the Air Transport Association for acquiring the services of Robert L. Turner, recently of Northeast Airlines, to head up Air Traffic Conference work . . . To Stanley Gewirtz for his valuable work at ATA and his joining National Airlines in an executive post.

Wayne W. Parrish

LETTERS

The NEW American Aviation

To the Editor:

I like your new format very much, particularly the way you have organized, Airtrends, Washington Trends and Transport Trends. Best wishes for the continued growth of AMERICAN AVIATION. G. B. SHAW, *president Martin International, Baltimore, Md.*

Congratulations on the bright new face of AMERICAN AVIATION Magazine . . . Typography and graphic presentation are something of a hobby with me, so I was especially impressed. The special sections on Transport Trends and Washington Trends, printed on quickly identifiable colored paper, should appeal to busy airline people.

In achieving your "new look," I'm glad to see you have retained the established features which have made me a friend of AMERICAN AVIATION for years . . . CARTER L. BURGESS, *president Trans World Airlines, New York, N. Y.*

Your publication was splendid in every way before, but the new format is even better! It is more readable, more informative, and more interesting; thanks for doing such a fine job. W. N. WILKERSON, *managing partner John T. Everett & Co., Memphis, Tenn.*

AMERICAN AVIATION's bright, new dress is most attractive. My congratulations for the improvements in type and format which you have made in your already excellent periodical. We shall be awaiting with interest the further improvements you have promised for the coming year. The new AMERICAN AVIATION is setting a worthy pace for the fast-moving industry it serves and has helped pioneer through the hectic and uncertain years. A. M. ROCHLEN, *vice president-public relations, Douglas Aircraft Co., Santa Monica, Calif.*

You have improved the magazine. It's a better product. Congratulations. JAMES W. AUSTIN, *vice president-traffic & sales, Capital Airlines, Washington, D. C.*

Congratulations on the new format of AMERICAN AVIATION magazine! It's readable, well arranged, and the new typography and departmentalization is splendid. It looks like a fine step forward. AVERY McBEE, *director public relations, Aircraft Industries Assn., Washington, D. C.*

I like the new makeup very much indeed. You have good readable body type and a good selection of attractive and efficient headlines . . . S. RALPH COHEN, *public relations officer, International Air Transport Assn., Montreal.*

I am very pleased with the new format and tear-out sheets in AMERICAN AVIATION. FREDERICK L. TUTTLE, *Jennings, Mo.*

Congratulations on the new format. Although the changes of this dear-to-hearts publication are a little startling—and it required some quick mental adjustment and gymnastics for me to get "in focus"—I like it. This seems to be the consensus of all who have seen it. STEWART FAULKNER, *director of publicity, Continental Air Lines.*

Editor's note: Above are just a few of the many comments received on the new format of American Aviation. Readers' comments on the NEW American Aviation are welcome and appreciated.

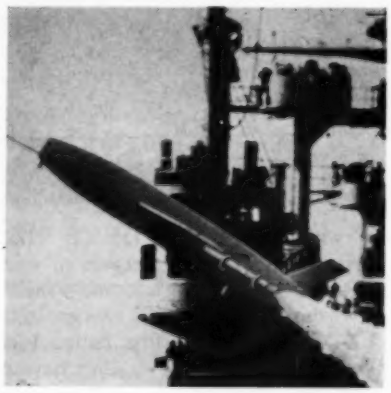
Who Guides the Regulus?

To the Editor:

We, at Advance Industries, Inc. (formerly Ultrasonic Corporation) read with interest your article on page 24 of your February 11, 1957, issue.

In view of our participation in the Regulus Program, we would like to take the liberty to inform you what we believe the true situation to be.

Reference is made to conflicting guidance systems sponsored by the Bureau of Aeronautics with Bendix Radio



Division. We believe this contract was terminated successfully and the Guidance System performed its original intended task.

Stavid Engineering Company, to the best of our knowledge, has never been responsible for the development of the Regulus Guidance System. We further understand the Stavid organization took an original SV-1 Radar which had been modified by Naval Electronics Laboratory in San Diego and placed it in production. They also did a creditable job of developing a check-out console for the system. In addition to this, they were the recipients of a field service contract to maintain various elements of the Guidance System.

We believe that full recognition should be given to BuAer and Chance Vought, who very capably conducted the system development program, and brought it forth to a condition where the Bureau of Ships could then place orders for the tactical Guidance System. In your article there would seem to be an indication of a conflict between BuShips and BuAer on this project. To those of us who have been associated with this program, nothing could be further from the truth. BuShips contributed heavily to this program.

Since we presently build (and originally developed) the Decoders, Control Boxes and CP-98 Navigational Computer, we believe we had more to do with the development of the Guidance System on the Navy Regulus System than any other single company.

In closing, we cannot help but feel that the least publicized company name in the Navy Regulus Program, for contributions made on Guidance System development, is our own—Ultrasonic Corporation, now Advance Industries, Inc. *Dr. Franklin F. Kates, Director of Research and Development, Advance Industries, Inc.*

Liked Beller's article

To the Editor:

I appreciated the recent article by William Beller on 1,800°F alloys (AMERICAN AVIATION, Feb. 25, p. 43). It is difficult for most of us to keep up with the latest progress in this field. Yet, metallurgical problems are the worst we face. *KURT R. STEHLING, 4122 Propulsion Head, Vanguard, The Glenn L. Martin Co., Baltimore, Md.*

Enjoyed TCA story

To the Editor:

I certainly enjoyed your very comprehensive article "TCA sets pace in turbine transport" (AMERICAN AVIATION, March 11, p. 83). *D. V. RICHARDSON, District Sales Manager, Trans-Canada Air Lines, New York, N. Y.*

He sympathizes

To the Editor:

Still on the "Name Withheld" subject, I should like to sympathize with First Officer Dickinson (AMERICAN AVIATION, Feb. 25, P. 14). I know how tough it is on a DC-6, what with having to run the Auto-pilot and keep a lookout for weekend warriors . . . while the Captain sleeps.

However, along with salary increases and other concessions, the ALPA will probably ask that some sort of automatic proximity warning device be installed so that both pilots can sleep at once, and then F/O Dickinson will arrive at home base all fresh and recuperated. *ATR 445519.*

Appreciation from Los Angeles

To the Editor:

Your editorial support of the recent complaint and petition of the Los Angeles Chamber of Commerce in the matter of American flag air carrier service between Los Angeles and Mexico City (AMERICAN AVIATION, Feb. 25, p. 9) is greatly appreciated.

We understand that an agreement has been reached which provides for the right of an American flag air carrier to fly between Los Angeles and Mexico City.

The cooperation evidenced by your editorial support was a clear demonstration of western solidarity in behalf of a common need.

We are pleased that it has resulted favorably in so short a time. *CHARLES E. DUCOMMUN, President, Los Angeles Chamber of Commerce.*

ENGINEERS . . .

Would you like to learn how the "MAC Engineer" lives and plays? This pamphlet contains color pictures of typical middle-income homes in suburban St. Louis, and actual figures of cost, taxes, and utilities. With each home are pictures of nearby public schools. Also, cost comparisons are made with other areas concerning general cost of living, state gasoline tax, and state income tax. A two-year weather picture is included.

We have not attempted to describe the "hospitable nature" of our neighbors. We hope you and your family will discover this for yourselves.

To secure this attractive four-color brochure, complete and mail the coupon below.

MACareers Are Successful Careers!

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Please send me your pamphlet, "St. Louis, A Good Place To Live And Raise A Family!"

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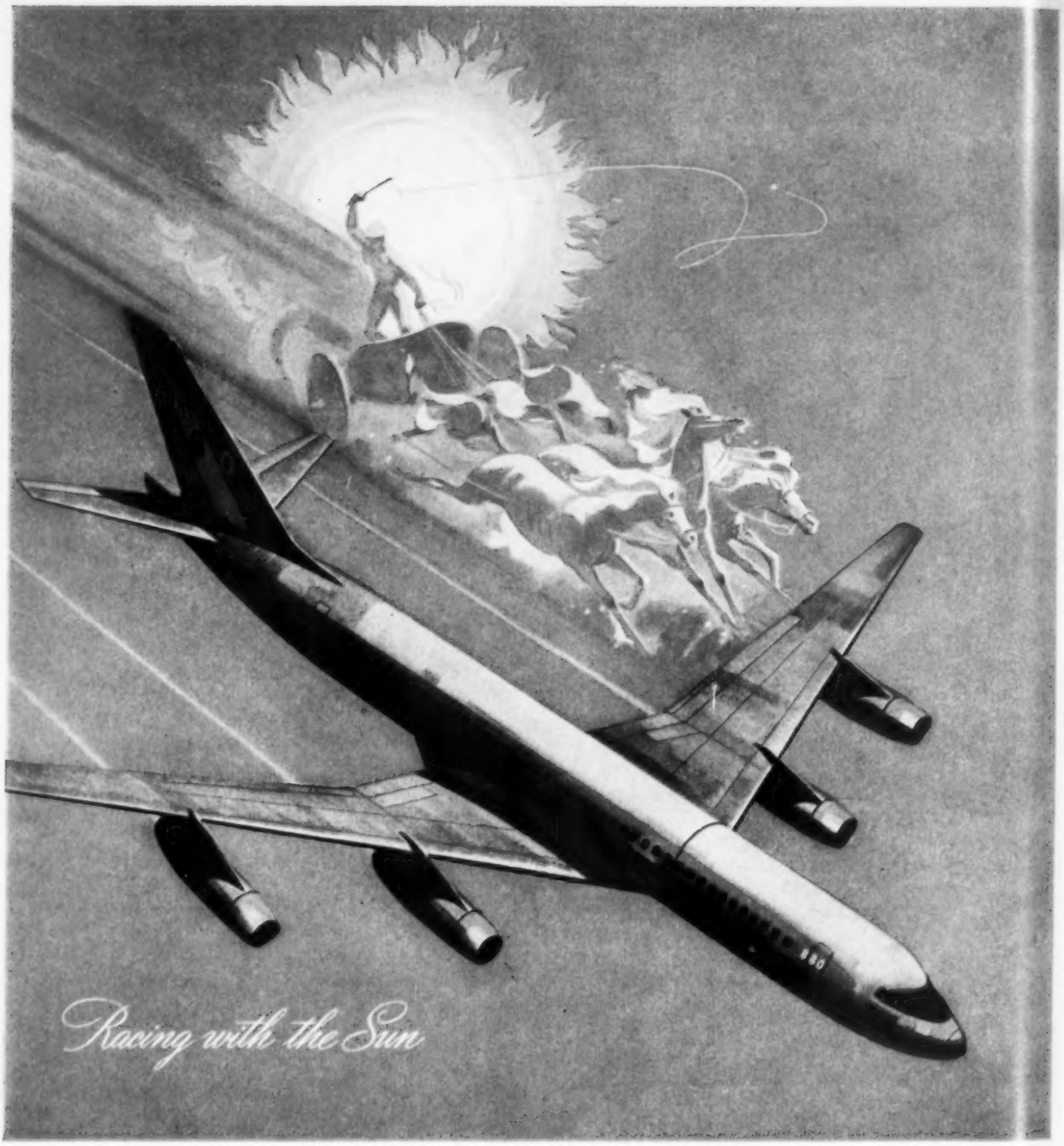


CONVAIR 880: World's Fastest Jet Passenger Plane!

Racing with the sun at 615 miles an hour, Convair's 880 Jet-Liner will cut your travel time in half! The only jet transport designed to operate from hundreds of existing airports, it will bring silent, vibrationless flight to travelers everywhere . . . big cities and small.

Convair's 880 Jet-Liner, powered by General Electric CJ-805 engines, will be delivered to leading airlines* for world-wide service beginning in 1959. In this new era of jet transportation, Convair's luxurious 880 Jet-Liner will be the world's fastest passenger plane—truly master of the skies!

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION

*AMONG AIRLINES TO FIRST OFFER CONVAIR 880 JET-LINER SERVICE WILL BE TWA • Delta • TRANSCONTINENTAL S. A. *(Argentina)*

AIRTRENDS

Long-awaited transfer of Navy's Flogwings to Military Air Transport Service under the "single manager" plan announced by the Pentagon in December still hasn't taken place. What's more, MATS officials admit they expect to pick up only 15 additional four-engined transports when the transaction finally does go through. That's all that will be left to MATS after Navy diverts some 30 planes to fleet and administrative use.

Secretary of Defense's office isn't alarmed, however. An official says the 15 planes are just a starter and that more may be assigned from Navy to MATS if a later OSD review supports such action. Air Materiel Command's Logair operation will also be shifted to MATS—despite USAF objections—if the review supports the action.

Army will push for what it says is an unmet requirement for a big intercontinental transport. USAF contention that Douglas C-133 can carry 94% of the C-132's 100,000-pound payload is based on USAF's longest critical hop, the 2,200 miles from San Francisco to Hawaii. Army wants to carry the payload nonstop to Europe (3,750 miles) and to Tokyo (4,000 miles).

Army says it needs sufficient strategic airlift to move combat echelons of two divisions (troops, combat and support equipment) into a combat zone within a few days rather than the month it took to get strength to Korea. Weight of each air transportable combat echelon is estimated at 13,000 tons.

Army may get some surprising support from the Navy in its campaign. Navy has a similar requirement for the Marine Corps if the product isn't too expensive.

Airframe manufacturers are heeding USAF suggestion that they look to subcontract and overhaul work to take up slack in prime contracts and to keep plants going between phaseout and new buildup. North American Aviation has set up an overhaul and maintenance department for its Columbus division. Lockheed's Marietta plant is working on its first commercial business under subcontract from Fairchild for F-27 fuselage tooling. Republic Aviation has its first subcontract, from General Electric, to build nose cone structural units for the ICBM. Temco, a large subcontractor and overhaul company, has other plans, however. It has announced a five-year project to build up prime missile and electronic contracts to 50% of total business.

Upward surge in flyaway costs of new military aircraft is matched only by zooming price tags for support equipment. Comparison of the $300,000 B-17 of World War II with the $3-million B-36 and the $8.8-million B-52 is well known. Not so well publicized are the less glamorous but equally essential support items—and they represent a big headache for USAF planners trying to hold down the size of the budget.

The modern bomber requires refueling aircraft not necessary with the B-17. Some $800,000 in ground equipment is needed to support the B-52, as against only $78,000 for the B-17. And supply managers must buy, stock and distribute a staggering total of 46,000 line items to keep the B-52 in the air, against 6,400 needed for the B-17.

DIGEST

Newbury, chief of Defense Dept. R&D program, plans to increase emphasis on applied research

Defense Secretary Wilson has issued a directive giving official status to his earlier announcement of the consolidation of all research, development and engineering activities into one organization. It vests in the hands of 76-year old Assistant Defense Secretary Frank Newbury virtually life-and-death power over all military R&D projects.

As head of the new all-powerful Office of Research and Engineering, Newbury told a news conference his aim will be to cut down on development spending while increasing activity in applied research.

Backed by a Hoover commission recommendation, the septuagenarian Defense official had fought long and hard for the consolidation on the grounds that development activity expensively overlapped in the old R&D and Engineering offices.

In addition to his "veto" power over individual military development and research projects, Newbury hopes to extend his office's jurisdiction deeper into applied research. He revealed that he is seeking authority for Defense to initiate and promote research in which the services "think they have no interest."

Funding for such programs could be accomplished out of the Defense emergency appropriation or else will be specifically requested in fiscal 1959, if the proposal is approved.

Under terms of the directive, Newbury is empowered with:

Administrative direction of the semi-autonomous Weapons System Evaluation Group. While he said no present changes are contemplated, he "would like to have more of its time for evaluating weapons." He pointed out that the group has been working almost exclusively on assignments from the Joint Chiefs of Staff, evaluating paper studies. Pentagon is speculating that WSEG will play a prominent role in Newbury's review of current development programs whereby he will eliminate duplicating and "unnecessary" projects.

Policy-making power to assure that all programs and projects are "sound and integrated and give appropriate emphasis to the basic and applied research requirements for the introduction of new types of weapons and equipment." Programs must meet planned objectives of "attainment of minimum number of types and sizes of weapon and equipment systems with least cost, effort and time; and sound design based on factors of producibility, mobility, transportability, simplicity of operation, ease of maintenance, simplicity of logistics support and conservation of critical materials."

Making recommendations for assignment of specific R&D programs to a military department "whenever it appears that military effectiveness may be increased, unwarranted duplication eliminated and efficiency and economy promoted."

Military departments are instructed to supply all data which Newbury requests.

Authorization to "insure effective implementation by the military departments of Defense policies, plans and programs within his field of responsibility."

Development of maintenance engineering standards to assure that maintenance receives "adequate attention" during the design and production engineering phases of developments, as well as making certain that the military departments adequately plan and implement maintenance and modification programs.

Defense officials have staunchly denied rumors that the new office would be given jurisdiction over Missile Czar Eger Murphree's functions when he leaves the post shortly. Observers point out that the directive does not except missiles, but broadly speaks of modern weapons systems and equipment.

Newbury himself lent some basis to the rumor. Although he denied that ballistic missiles would come under his jurisdiction, he did say his office would coordinate with the department on long-range missiles that overlapped with ballistic functions. When Murphree was appointed, he was given juris-

NACA five-stage rocket hits 8,000-mph mark

AMERICAN AVIATION has obtained exclusive photographs of a unique five-stage rocket assembly built by the National Advisory Committee for Aeronautics. It attained the greatest speed ever recorded for an NACA rocket in a free flight from the Pilotless Aircraft Research Station at Wallops Island, Va.

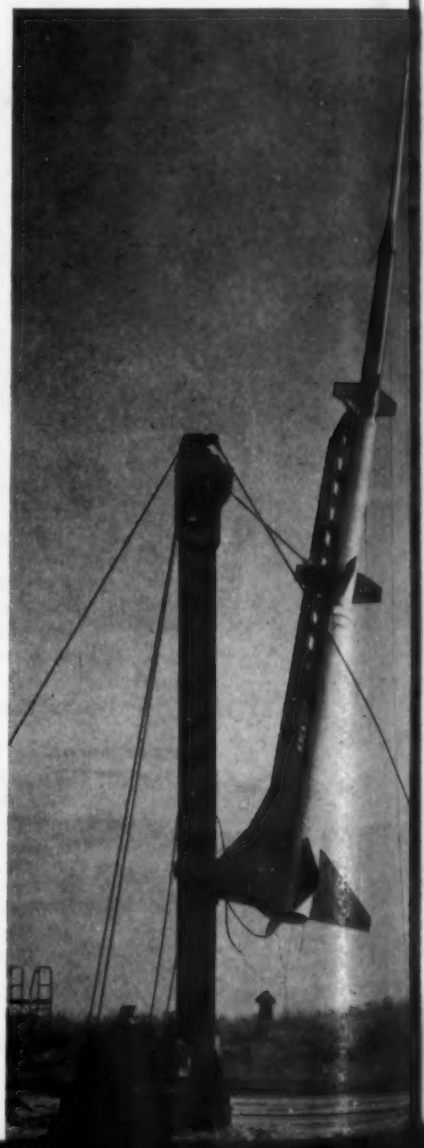
Although NACA officials declined to disclose the new speed mark registered by the rocket assembly, it is understood the figure is on the order of 8,000 mph. This eclipses an earlier record of 6,864 mph (Mach 10.4) reached by an NACA four-stage rocket fired from Wallops Island.

The vehicles are being used in nose cone re-entry experiments designed to provide data for the Air Force's intercontinental ballistic missile (ICBM) program.

"The speed mark was achieved by firing the last three stages of the rocket in sequence after the vehicle went 'over the top' into downward flight," NACA said. "The first stage (Honest John missile motor) and the second (Nike motor) were fired on the upward course; after nosing over, the other three stages (Nike, Recruit and T-55 commercial unit) were fired in sequence after burnout."

Manufacturer of the Honest John is Douglas Aircraft Co., Inc. Both Goodyear Aircraft Corp. and Ingersoll Div. of Borg-Warner Corp. manufacture Nike boosters of the type used in the five-stager. Thiokol Chemical Corp. supplies both the Recruit and the T-55. (The Recruit rocket also constitutes the second and third stages of the Lockheed X-17 re-entry research rocket used by the Air Force at Patrick AFB, Fla.; first stage of the X-17 is a Thiokol Sergeant manufactured at Redstone Arsenal, Huntsville, Ala.)

NACA five stager: Fastest yet.



diction over all missiles of intermediate range and intercontinental range, while concentrating on the ballistics category. Newbury's statement was interpreted as meaning that such projects as Snark and Navaho will be in his domain.

Organization of the new R&E office has not been completed, although a tentative plan has Wilson's approval. Newbury, however, indicated that it would be divided into about seven to nine divisions, each including research, development and engineering arms. Activities would roughly be broken down into atomic energy, general sciences, ordnance, guided missiles and aeronautics.

Boeing to use Army plant for Bomarc, B-52 work

Boeing Airplane Co. will use a former Army Corps of Engineers facility in the Seattle area for production of the Bomarc missile and B-52 bomber. The 347,000 sq. ft. plant was made available through an Air Force-Army agreement.

Boeing will use 100,000 sq. ft. of the facility for Bomarc work and the rest for the B-52. In addition, 200,000 sq. ft. of the Boeing Development Center under construction will be used for missile work.

President's advisers propose establishment of new national flight systems test facility

Establishment of a national flight systems experimentation facility for study of air traffic control, at a cost of $25-$50 million, was recommended by Lloyd J. Perper, aide to Edward P. Curtis, special assistant to President Eisenhower for aviation facilities planning, at the national convention of the Institute of Radio Engineers.

Perper urged systems engineers to return to the "real world" in designing proposed new systems for traffic control.

"An underlying difficulty with the systems engineer," he said, "is loss of contact with the real world. His output is hardware. Past procedure has been to start with formal requirements or mathematical methods of solution. This is theory without experience."

Such arguments as GCA vs. ILS and Tacan vs. VOR/DME have obscured the real issues, which he says are "vital, unrecognized technical issues of an entirely different sort that should have been faced years ago."

Among these, he declared, are the questions of whether it is correct to consider aircraft as oversimplified centers of gravity and whether the basic nature of polar coordinates is compatible with ATC requirements.

Even the establishment of a clear, central aviation authority in place of the present loose structure might not correct the situation, Perper said. It could result in even more instances of multiple installation of different equipment having identical performance.

Analytical tools available to the aviation systems engineer now are not equal to the enormity of the task faced, Perper said. Fully reliable tools, however, would be available in the proposed new facility, he added.

Curtis himself told another IRE session that studies of his systems engineering team had led to the conclusion that an integrated research and development facility is needed. He addressed the professional groups on aeronautical and navigational electronics and military electronics.

"The successful evolution of a modern ATC system is dependent, among other things," Curtis said, "upon a successful evolution of the appropriate instrumentation, both ground and air. Although much of the technology exists now for such instrumentation, it needs adaptation and development of procedures for use, and these tasks should be assigned to an integrated research and development facility."

The proposed facility would include an airfield with laboratories, a vast airspace reservation surrounding it and perhaps be close to a coast. Satellite fields around the central station would serve as part of the facility.

It would be manned by a few hundred engineers including some with both electronic and aerodynamic experience and some with pilot experience.

Military, civil and general aviation aircraft, numbering about 50-100 planes, would serve as the nucleus for the tests. They would be augmented by other available aircraft as needed.

Piasecki obtains option to build British copter

Piasecki Aircraft has an option for U.S. manufacture of the Ultra-Light jet helicopter, designed and built by Fairey Aviation Co., Ltd.

The two-seat, jet-powered single rotor helicopter reportedly is being considered by the Army for evaluation with other models in a program to replace small observation helicopters now in use.

Ultra-Light specifications are: rotor diameter 28 ft., 3½ in.; overall length, less rotor, 15 ft.; overall height, 8 ft. 2 in. Empty weight is 995 lbs., top speed over 105 mph, maximum loaded weight 220 lbs., normal gross weight 1800 lbs.

Powerplant is a Turbomeca Palouste.

Douglas proposes turboprop for Navy re-supply

Douglas Aircraft Co. has proposed its Model 1906A four-turboprop-powered shortfield transport for Navy use in carrier operations for fleet aerial re-supply.

The new design, essentially an adaptation of its Model 1940 and 1940A transports unveiled recently (AMERICAN AVIATION, Mar. 25), would also serve as a Marine light assault mission, according to Douglas.

Major design changes for the Navy role would include addition of arresting and catapult hooks for carrier operations. Quickly attachable skis would fit it for Marine roles including operations from mud fields, sandy beaches or snow-covered sites with only 400 feet of ground run.

Proposed Douglas specifications call for a gross weight of 65,500 lbs., payload of 15,000 lbs. and cruise speed of 243 knots in air re-supply missions extending 1,500 nautical miles to a task force at sea. In Marine service, gross would be 59,700 lbs., payload 8,000 lbs. and cruise speed 267 knots.

Overall dimensions include wingspan of 102 ft. 6 in.; fuselage length of 88 ft. 2 in. and height at tail, 36 ft. 8 in. Powerplants would be four Lycoming T55s.

WASHINGTON TRENDS

Pentagon promotions raise questions

Top level personnel shifts at the Pentagon (see story p. 32) have met with general satisfaction of the military aviation community in Washington.

Most felt promotion of Gen. Nathan Twining to Chairman of Joint Chiefs of Staff was inevitable, and that elevation of Donald Quarles to Deputy Defense Secretary, James Douglas to Air Force Secretary and Gen. Thomas White to USAF Chief of Staff were sound appointments.

But there remains speculation about two other important areas: Who will succeed Defense Secretary Charles Wilson if he retires later this year; and who will fill the spot vacated by Gen. White—Vice Chief of Staff for Air Force?

Many feel the appointment of Quarles puts him in line for Wilson's post, and there is a strong editorial campaign in some magazines and newspapers in support of such a move. But some Pentagon insiders are dubious of Quarles' chances.

While no one doubts the former USAF Secretary's great ability, questions have been raised over whether he has the political weight necessary to carry him into the post. Some of the other candidates mentioned include former New York Gov. Thomas E. Dewey and Gen. Alfred Gruenther, former Nato commander and now head of the Red Cross.

A number of names have been mentioned for the Vice Chief of Staff. Most likely are Gen. Laurence Kuter, commander Far East Air Forces, and Gen. Edwin Rawlings, AMC commander, with Gen. Otto P. Weyland, chief of Tactical Air Command, and Lt. Gen. Frank Everest, Deputy Chief of Staff-Operations, also considered in the running.

Gen. Curtis LeMay, commander of Strategic Air Command, has been prominently mentioned elsewhere as a hot prospect for the post, but considerable skepticism over the merit of the proposal has been expressed by some Air Force insiders.

GAO hits subcontracting methods

Government probers are concerned over Air Force subcontracting techniques, which have prompted General Accounting Office to clamp down and urge Congress to investigate "hazy areas."

Top GAO officials disclosed to the House Investigations Subcommittee troubles Ford Motor Co. encountered trying to refund an excess $5-million subcontracting profit to the government. Fact that neither USAF nor the prime contractor displayed much interest in accepting the money alarmed GAO.

Consequently, government auditors have called for tighter rules and now plan a penetrating independent study of overall Pentagon buying habits.

Main gripe is the loose system that permits premature redetermination. GAO wants firms to chalk up solid production experience before revising cost data, develop a more sensitive price-consciousness. Moreover, if subcontractors trim costs along the production lines, GAO wants the saving handed over to Uncle Sam, not shunted away elsewhere.

These disclosures have caused Subcommittee Chairman Hebert to ask subcommittee staffers to re-examine questionnaires from last year's airframe industry investigation to see whether primes may have overlooked some subcontracting work in responding to the congressional query.

Probers tackle Pentagon secrecy

House investigators are ready to scrutinize promised Pentagon information policy reforms. But chief critic of Defense's superfluous secrecy, Rep. John E. Moss (D-Calif.), has voiced "cautious enthusiasm" over Secretary Wilson's plan to name a "declassification czar" to strip secrecy labels from piles of dusty Defense papers.

The House information subcommittee will examine a number of other actions aimed at revising the Pentagon's information security system in line with recommendations of the Coolidge Committee last year.

Specifically, Moss wants to know:

How much power the declassification chief would enjoy.

What Wilson will do about withholding so-called departmental "working papers" that carry no military security tag.

Latest of the proposed Wilson directives, which would create sanctions against contractors suspected of releasing classified data, also is due to come under study.

Questions for engine builders

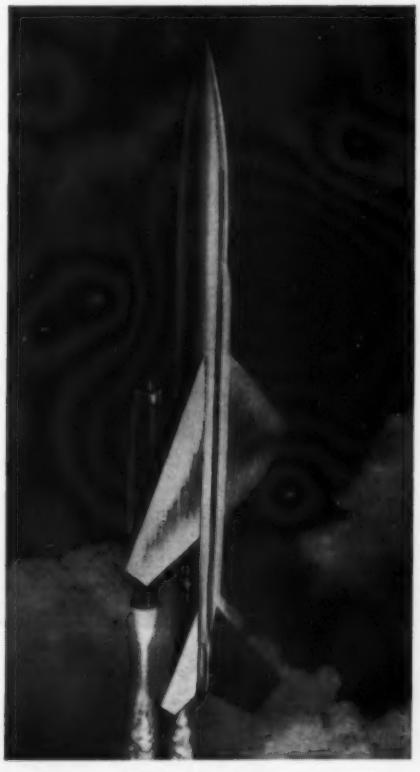
Hebert Investigations Subcommittee probe of the aircraft engine industry (page 39), will go into past contracts of two companies no longer in the engine business: Buick Motor Div. and Chevrolet Aircraft Engines Div. of General Motors.

Other engine makers who have received questionnaires: Pratt & Whitney, Westinghouse, Fairchild, Boeing, General Electric, Allison, Wright Aeronautical, Air Cooled Motors, Ford Aircraft Engine Div., Lycoming, Nash-Kelvinator, McCulloch Motors, Studebaker-Packard and Willys Motors.

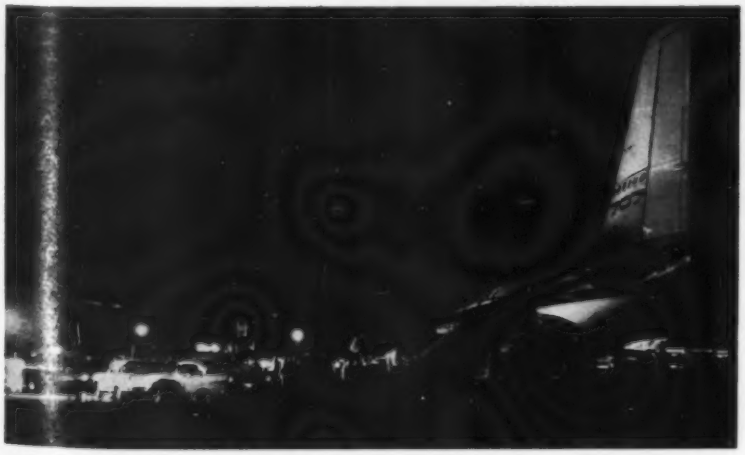
BULLETIN FROM **BOEING**

IT'S A SMALLER WORLD. Air Force crews made aviation history when they flew three Boeing B-52 jet bombers around the world, nonstop, in 45 hours, 19 minutes. The B-52s were refueled aloft from Boeing KC-97 tankers. Previous 'round-the-world record was set in 1949, by the famous B-50 "Lucky Lady"—another Boeing.

AFTER THE LANDING, the Air Force flight commander commented: "With a plane like the B-52 and the fine crews we have, the flight was strictly routine." These three Boeing B-52s are the first jets ever to circle the earth nonstop.



BOMARC. Boeing is conducting successful firing tests of supersonic defense missiles. In addition to the BOMARC missile, Boeing is developing an entire weapon system, including launching means, bases, communications and electronic guidance.



AMERICA'S ONLY JETLINER, the Boeing 707, is backed by the same unequalled jet experience that produced the history-making B-52. Pictured at Los Angeles airport, the 707 is helping officials set standards for commercial jet flight in U. S.

BOEING

MORE ABOUT BRISTOL'S "WHISPERING GIANT"

Noise-level tests prove that

World's largest, fastest, quietest turboprop airliner reduces noise levels to a new low

Official noise-level tests at a large international airport have underlined the amazing quietness of Bristol's Whispering Giant. With a ground noise-level of 81 decibels when taking off, the Britannia was 50 decibels quieter than jet transports flying today, 20-25 decibels quieter than current four-engined airliners . . . and quieter even than twin-engined airliners.

The Britannia carries up to 133 passengers at amazingly low operating costs. She is the world's most versatile airliner because she maintains her matchless standards of efficiency and economy on an extremely wide variety of stage-lengths . . . from 5,500 right down to 200 miles.

Powered by four 4120 h.p. Bristol Proteus turboprop engines, the 175,000-lb. Britannia cruises at a guaranteed 400 m.p.h. with all the smoothness and whispering luxury associated with turboprop flight.

at the Britannia WHISPERS!

The Britannia has been more thoroughly pre-operationally tested than any airliner ever before. Her structure has undergone over 54,000 simulated flying hours in a pressure tank . . . while her engines have been proved in more than 74,000 flying and bench hours.

She is the latest product of a company long renowned for progressive ability, achievement and reliability in aviation techniques.

The Britannia has met with worldwide recognition and demand. She is now in commercial service with British Overseas Airways Corporation and has also been ordered by Northeast Airlines, Canadian Pacific Airlines, El Al Israel Airlines, Hunting-Clan Air Transport, The Royal Air Force and The British Ministry of Supply.

BRISTOL

Britannia

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. . . **THE KC-135 AND 707** use Joy fans for a variety of cooling and ventilating jobs. And Boeing was going on solid experience—Joy fans and blowers had proved themselves on the B52 and earlier Boeing craft. This time they handed us some tough assignments. For instance, a lightweight 7.5" dia. blower moves 800 cfm *continuously* at 130°F to cool vital electronic equipment.

20 CFM TO OVER 6000 CFM is the range of Joy Aircraft Fans . . . these high performance miniatures weigh from 10 ounces to 50 pounds. Leaders like Lockheed, Boeing, Douglas, Sikorsky, Grumman, North American specify Joy Axivane Fans. Write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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WHEN-WHERE

APRIL

ATA **Air Traffic Conference** annual meeting, St. Charles Hotel, New Orleans, Apr. 10-11.

IRE **Professional Group on Telemetry and Remote Control,** national symposium, Philadelphia, Apr. 15-17.

Aircraft Ball Bearing Conference, sponsored by New Departure Div. of General Motors Corp., Statler Hotel, Hartford, Conn., Apr. 16-17.

Arnold Air Society annual conclave honoring 50 years of military air power, Hotel New Yorker, New York City, Apr. 17-20.

Jet Engine Hydraulic Symposium, sponsored by Vickers, Inc., Hotel Statler, Detroit, Apr. 22-24.

International Airline Navigators Council annual conference, Hotel Piccadilly, New York City, Apr. 23-25.

European Civil Aviation Conference, Madrid, Spain, Apr. 24.

OX5 Club, national meeting, Municipal Airport, Norwood, Mass., Apr. 25.

Airport Operators Council, Conrad Hilton Hotel, Chicago, Apr. 28-May 2.

Flight Test Instrumentation Symposium, Statler Hotel, Los Angeles, Apr. 29-May 2.

Society of Aeronautical Weight Engineers, annual national conference, Broadview Hotel, Wichita, Kas., Apr. 29-May 2.

National Materials Handling Exposition, Convention Hall, Philadelphia, Apr. 29-May 3.

MAY

Aeronautical Training Society, annual meeting Mayflower Hotel, Washington, D.C., May 2-3.

Aviation Education Conference, sponsored by California Aviation Education Assn., San Jose State College, San Jose, Calif., May 3-5.

American Assn. of Airport Executives annual convention, Shamrock-Hilton Hotel, Houston, Tex., May 5-8.

Aero Medical Assn., 28th annual meeting, Shirley Savoy Hotel, Denver, Colo., May 6-8.

IRE and Radio Technical Commission for Aeronautics, spring meeting, Ambassador Hotel, Los Angeles, May 7-9.

American Helicopter Society, annual forum, Sheraton-Park Hotel, Washington, D.C., May 8-11.

Aeronautical Electronics Conference, sponsored by the Institute of Radio Engineers, Biltmore Hotel, Dayton, May 13-15.

American Society of Civil Engineers, Jet Age Airport Conference, Park-Sheraton Hotel, New York, May 15-17.

American Institute of Industrial Engineers, 8th annual conference and convention, Hotel Statler, New York City, May 16-18.

Armed Forces Communications and Electronics Assn., convention, Sheraton-Park Hotel, Washington, D.C., May 20-22.

Design Engineering Conference of American Society of Mechanical Engineers, Coliseum, New York, May 20-23.

National Fire Protection Assn, annual aviation fire safety seminar, Hotel Statler, Los Angeles, May 20-24.

International Air Show, Le Bourget Airport, Paris, May 24-June 2.

Aviation Writers Assn., annual convention, Chase and Park-Plaza Hotels, St. Louis, May 26-June 2.

Chance Vought Aircraft

A tight squeeze for safety

It is impossible to squeeze water but All American has developed a water "squeezing" principle to increase the safety of commercial jet transportation.

Absorbing energy by drawing a piston through a water-filled pipe has resulted in arresting gear now in service with the Armed Forces.

Now All American engineers have carried the water "squeezing" principle one step further and have developed an emergency overrun barrier for commercial airports. Stopping jet transports in a few hundred feet in case of brake or reverse thrust failure, this new concept prevents loss of million-dollar aircraft and possible injury to passengers and crew.

All American's water "squeezing" principle makes the barrier safe, economical and easy to operate.

Engineers interested in carrying out "impossible" ideas, like "squeezing" water, contact Walt Jones, Personnel Manager, All American Engineering Company, Box USS 2668, Du Pont Airport, Wilmington 5, Delaware.

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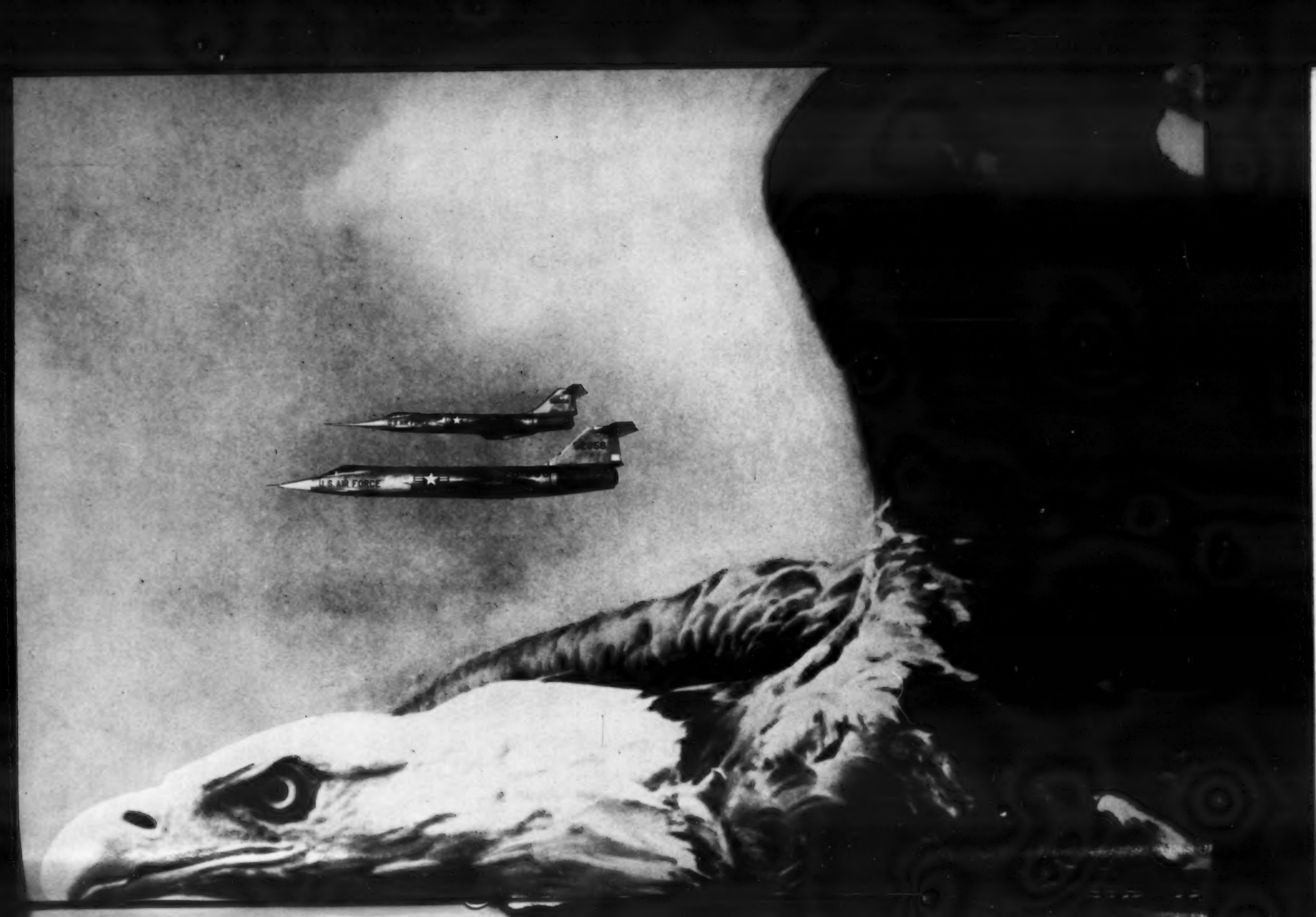
U.S. AIR FORCE

USAF F-104 Starfighter, the "Missile With a Man in It."

IF, AS YOU READ THIS, YOU SHOULD HEAR A LOCKHEED F-104 STARFIGHTER FLYING OVERHEAD, DON'T BOTHER TO LOOK FOR IT. THIS WORLD'S FASTEST JET WILL BE OUT OF SIGHT BEFORE YOU CAN FINISH READING THESE FEW WORDS.

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SPOTLIGHT

First flight of Ryan's deflected slipstream Vertiplane VTOL project is scheduled later this year. Ryan has an Army research contract on the project. Company annual report indicates that "several" X-13 jet VTOLs (Vertijets) now are flying.

Glossary of jet engine designations has broadened. Not widely circulated are these model numbers—some apparently old, but others new: Packard J41 and J49; Curtiss-Wright J51; General Electric J53; Fredric Flader J55; Pratt & Whitney J58; Curtiss-Wright J59 and J61; Ranger J63; General Electric J77; Continental J87, and Allison J89.

Turboprop engines not previously revealed include: GE T41; DeLaval T42; Curtiss-Wright T43; Allison T44; Pratt & Whitney T45; Fairchild T46; Curtiss-Wright T47; Pratt & Whitney T48; Curtiss-Wright T51; Continental T51, and Pratt & Whitney T52.

Boeing 707 prototype will fly early this summer with sound suppressors on all four engines. Jet transport already has flown with at least two suppressors. Later Boeing plans to fit the prototype with combination suppressors and thrust reversers for extensive testing.

Ryan Firebee target drones now are being fitted with infrared devices to attract heat-seeking missiles. While several systems are employed, most common are infrared flares hung on the empennage and infrared lights mounted on wingtips.

Half of Martin Aircraft's $810-million backlog represents contracts for guided missiles. Company reports it booked half a billion in new business during 1956 and increased its employment 8,653 during the year for a total of 29,249.

Distinction of being the most renamed missile unquestionably falls to Douglas' Ding Dong air-to-air vehicle. In addition to High Card and MB-1 designations which superseded original Ding Dong label (AMERICAN AVIATION March 25, P. 52), the missile also carries another tag, the DM-18, which represents Douglas Missile Project No. 18.

Convair has been discussing license production of the 440 Metropolitan with Japan Aircraft Maintenance Co. (JAMCO). If deal goes through, Japanese would be restricted to sales in specific areas of the world.

Newest entry in Air Force off the shelf competition for a multi-engine jet transport/trainer is McDonnell Aircraft with its Model 119. Bid for civil certification was made to Civil Aeronautics Administration January 25. Aircraft presumably is in the 8-10-place class, competitive with Fairchild M-185 and Lockheed GL-135.

Official model designation of North American twin-jet entry in AF competition for small jet utility design is NA-246.

French Air Force intends to use de Havilland Vampires as drones. French flight test center at Bretigny has developed a guidance system for the fighter that will give it a range of 60 miles.

Several foreign airlines reported about ready to order Fokker/-Fairchild F-27 Friendship turboprop transport: Sabena; Aerolineas Argentinas; Cubana; Aeronaves de Mexico; Trans Mar de Cortest (Mexico), and Avensa (Venezuela).

Navy has given Grumman a $129,299 contract to develop plans and specifications for a hydrofoil landing craft.

FOUR OPENINGS FOR FLIGHT TEST INSTRUMENTATION ENGINEERS

Electronic Development Instrumentation Engineer. To conceive, design, laboratory-evaluate and test intricate components and assemblies aimed at automation of data acquisition and analysis. Requires Electronics or Physics degree and one to four years experience in electronics design.

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Soot Solved This Problem

One thing Richard (Rick) MacDonnell could say for flight test instrumentation — it had variety. Here he was, in line of duty, hunting a coal oil lamp on the Mojave Desert.

Looking back, Rick saw that the whole Crusader instrumentation program had been a series of shifting scenes. He'd started by talking to different specialists, finding out the kinds of flight information they wanted. He learned a lot about heats, loads, amplitudes and flutter. These were the things Rick's instrumentation would have to detect.

Designing and building the system took him in another direction. There was the airborne equipment — up to 12 miles of wiring and 600 pounds of black boxes for a single demonstration aircraft. Each sub-system was environment-tested, breadboarded, checked out and packaged to fit key corners of the Crusader structure.

Taking shape at the same time was a mobile ground station — another project with which Rick was associated. It brought flight test telemetering and data processing closer to automation than they'd ever been before. At Vought's Mojave Desert test base, Rick's equipment clicked. It speeded preparation for the Crusader's dramatic operational debut — the Thompson Trophy-winning speed run.

There was just one hitch — a National Aeronautical Association rule which would limit altitude deviation to 328 feet during the Trophy dash. A Bureau of Standards barograph would ride with the pilot, its stylus etching out exact altitude on a smoked cylinder. Fair enough — but Vought's desert crew didn't have a workable way to blacken duplicate cylinders for practice. And precise warm-up flights were essential.

That's why Rick went hunting for a coal oil lamp. He found one in the store of a desert outfitter. Back on the base, the lamp was lighted and the wick turned up. It "sooted" the purpose perfectly.

Instrumentation means development adventure and variety at Chance Vought. Here, engineers of all specialties use initiative and self-expression to contribute to some of the most advanced instrumentation techniques in the industry.

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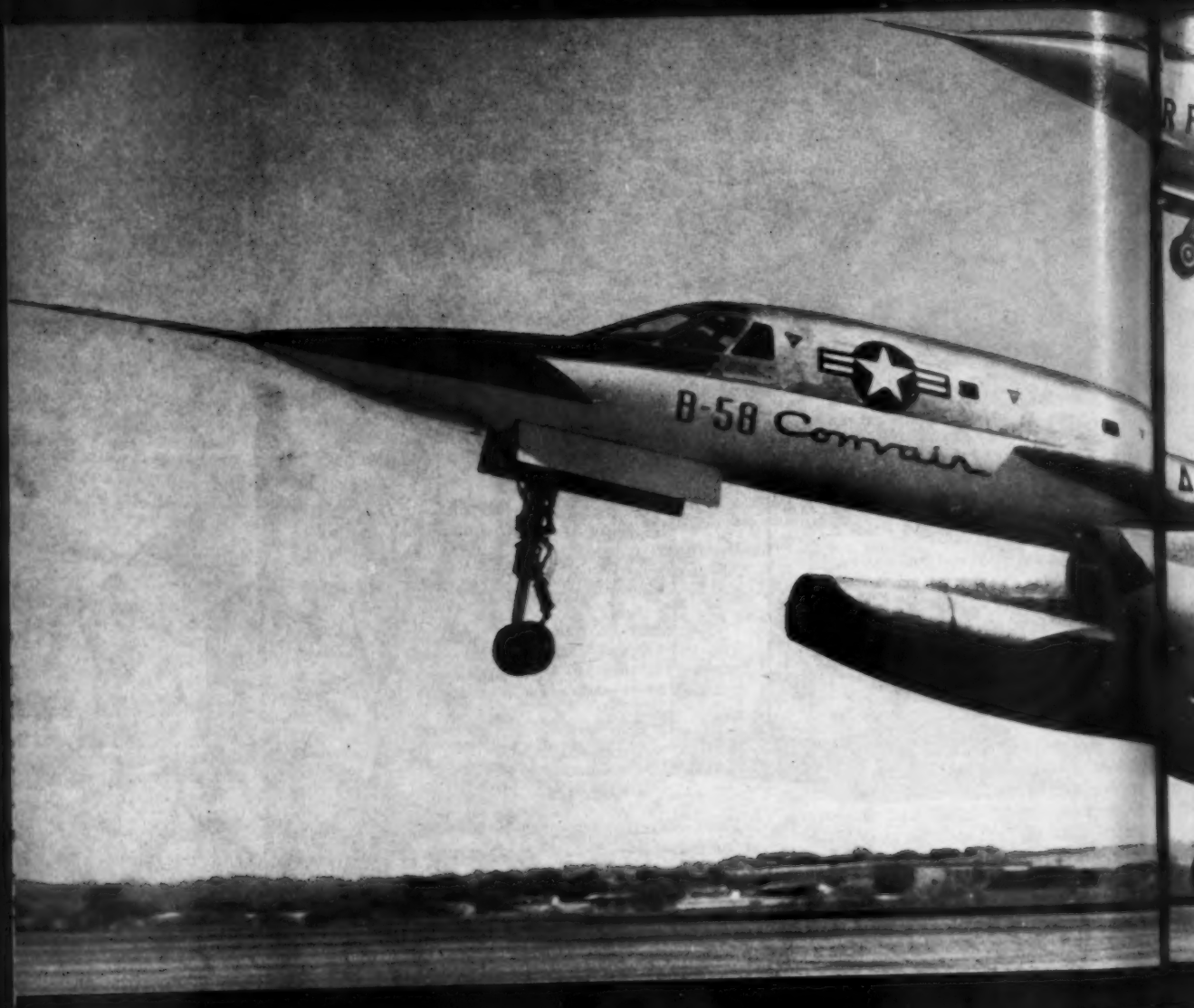

HOW GENERAL ELECTRIC J79 TURBOJET PAYS OFF IN SPEED

The fastest bomber and production fighter in the world (above) offer striking evidence of the performance and versatility of General Electric's J79 turbojet.

The ideal supersonic powerplant, the J79 brings extremely high altitude capability to USAF's Lockheed F-104A and Convair B-58, plus:

- **High thrust for fast take-off, climbs, supersonic capability.** The J79 delivers more thrust per pound than any U. S. turbojet of comparable size.
- **Low engine weight for light airframes.** Compact in design, the J79 is smaller and lighter than its famous G-E predecessor, the J47 turbojet.
- **Small frontal area for "clean" airframes, reduced drag.** The J79's minimum engine envelope contributes to low drag characteristics of airframes whether engine is mounted in fuselage or nacelles.

Today, the G-E J79's high power, light weight and small size are paying tremendous dividends—in speed—to American airpower. *General Electric Company, Cincinnati 15, Ohio.* 235-18

NEW 609-MPH CONVAIR JETLINER will be powered by G-E CJ-805 turbojet, ideal powerplant for medium-range operation. Above, G.E.'s Neil Burgess and Gerhard Neumann discuss model.

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Illustrated are typical examples of what MENASCO can do with these two processes to fabricate titanium components for aircraft and missile applications.

Major aircraft manufacturers look to MENASCO for efficient engineering, product development and new fabricating techniques.

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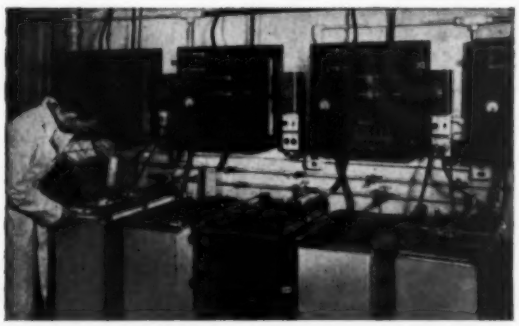

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Specially developed for use in aircraft where weight, space and power are at a premium, the AVQ-50 is the latest addition to the RCA weather radar family.

It enables your pilot to pinpoint turbulent areas many miles ahead and choose a smooth path around them. In the words of a pilot, it makes it possible to do broken field running instead of long, time-wasting end runs. It is also good for ground-mapping.

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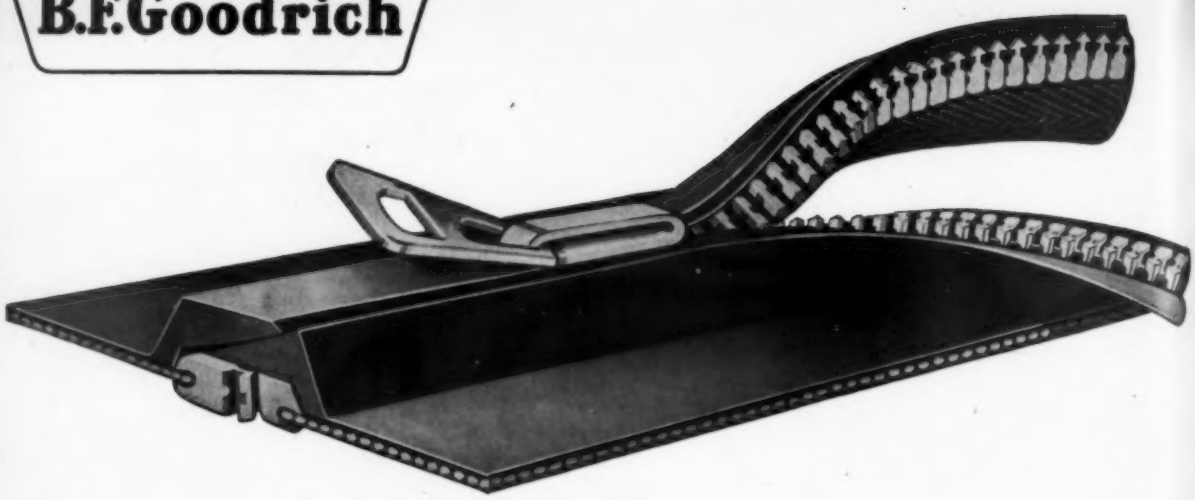


B. F. Goodrich zipper seals tight, zips open fast

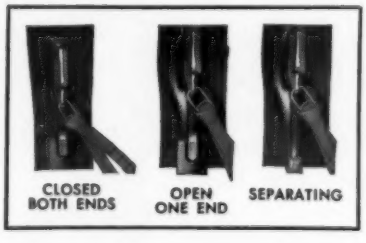
With only a zip, mechanic can get in and out of B. F. Goodrich fume curtain on McDonnell's F2H.

Baggage panels on Lockheed's Super Connies zip open for servicing in 33 places, provide strong, safe bulkheads.

B. F. Goodrich Pressure Sealing Zippers seal out dirt, fumes, and liquids—yet zip open in seconds for access.

Notice above how molded rubber lips overlap with hairline precision. They form a seal that tightens under external pressure and withstands any pressure up to the maximum strength of the zipper itself.

Pressure Sealing Zippers, which are made only by B. F. Goodrich, are used for air ducts, inspection ports, access doors, aileron gap seals and dozens of other uses. We're sure there's one for you.



BFG Pressure Sealing Zippers come in three basic styles, (left) designed to solve nearly any tricky sealing problem. Write for free folder.

B.F.Goodrich Aviation Products

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APRIL 8, 1957—VOL. 20, NO. 23

AMERICAN AVIATION

WORLD'S LARGEST AVIATION PUBLISHERS

Sonic Boom . . .

strange noise frightens people

Claim-conscious citizens think they can collect easy money, but 'damage' is usually doubtful

by Stratton Hammon
of Vibration Damage Specialists

LAST SEPTEMBER the National Air Show performed in Oklahoma City. The sound "barrier" was cracked seven or eight times at various altitudes and with various intensities. The only serious damage, possibly the only actual damage, occurred at the airport building which had a good deal of plate glass exuviated (shed its "skin") as the planes leveled out of dives.

However, it seems that "everyone wanted in on the act," with the result that at present some 3,300 homeowners and business establishments have filed claims for damage.

It seemed to matter little to many of the claimants that their property was located at such distances from the point of origin of the boom that even the detonations of the first atom bombs dropped on Hiroshima and Nagasaki would not have created damage. The Japanese residences were free of damage beyond the eight-mile radius, but this rather well-known fact had no effect on the Oklahoma claimants, one of whom was located 13 miles from the airport.

Imagine claiming damage from a sonic boom at almost twice the damage limit of an A-bomb! One man owned two business establishments and a dwelling situated in a triangle, seven, five and two and one-half miles apart, with the closest corner four miles from the airport. He made a claim on all three buildings.

This is a situation which will soon confront the aviation industry in general and airport managers and Air Boards in particular. There are three developments, two natural and one artificial, which will tremendously multiply this serious, troublesome, expensive predicament at an early date.

The two natural developments are the ones which have long plagued busy airports, the speedy increase in population and the even speedier increase in air transportation. Housing developments are crowding around the airfields at the same time some airline presidents are predicting a three-fold increase in passenger volume in the next five years. This circumstance was bad enough with the old prop equipment. New jet airliners will bring the matter to a crisis even if extreme care is taken about sonic booms.

Public becoming claim-conscious

The artificial development referred to is a new claim-consciousness which seems to be sweeping the public. As word gets around that a new way to make a claim has been discovered, litigation begins to mount. For the past decade we have been busy defending the great insurance companies, contractors, quarries, railroads and even the government from thousands upon thousands of claims made whenever commercial blasting is done in connection with construction projects.

Ten years ago a blast damage suit was almost unknown. Today it requires the constant effort of a number of firms to service the claims. It will be the same with sonic booms and normal jet takeoffs; indeed, the trend is already well on the way.

A small percentage of these claims will be fraudulent, but the majority will be the result of loose, wishful thinking. For instance, I believe many residences and commercial structures being currently erected are what is known as "jerrybuilt." The silent, but destructive natural forces such as expansion and contraction, shrinkage of wood, settlement, leakage, etc., begin at once to attack and damage these buildings.

A properly designed building is constructed to resist such natural forces, but too many contractors know little and care less about such things and the owner is left with a serious maintenance problem on his hands.

The owner is also largely ignorant of the silent destructive forces of nature. He has no apprehension of the power of some silent forces, but he does have a very active instinctive fear of noise. He is certain great noise is accompanied by danger and destruction.

Hence, at the first explosion or sonic boom that he can hear he will examine his house closely and will, of course, discover a great many cracks, for there is no house free of them. In a matter of hours he makes his claim—not against the contractor who actually built these cracks into the house, but against the persons who were unfortunate enough to create a loud noise in the neighborhood.

Here and there can be noticed an awakening that this situation is upon us and that measures must be taken to meet it.

An interesting article entitled "Is Sonic Boom an Explosion?", by John I. Hopkins and John J. McIntosh, appeared in the January 1957 issue of the *Insurance Law Journal*. We have had a small part in the preparation of a paper issued by the National Board of Fire Underwriters for the guidance of the insurance industry and called, "Jet Planes—Concussion Damages." There have been too few others.

Knowledge on subject scanty

The dearth of knowledge in regard to these phenomena, especially the effects of sonic booms upon structures, is easily explained. We are all pioneering in this new field. So far firms employing a combination of professional men and scientists have obtained the

best results. The most pre-eminent are those rare persons who combine a thorough professional knowledge of construction with the incongruous, usually war acquired, skill in the mysteries of air concussion—the modern tectonicologist.

Under the law, proof that certain claimed damage could not have occurred because the offending sonic boom was not of sufficient intensity or was too far removed to accomplish such damage is of less legal weight than proof that the alleged damage resulted from other definite causes which can be traced minutely to their sources.

Because of this the positive testimony of registered architects that the claimed damage has other origins has greater effect in the courts than the testimony of concussion experts or seismologists that the vibrations reaching a given structure could not have been damaging. Of course, the few specialists in vibration damage who can legally qualify to testify on both the negative and positive side of this question are particularly valuable to a defendant.

We are referring to those claims which have no basis in fact. These will normally comprise at least 99% of the total. The few cases of actual damage are easily recognized and quickly and honestly adjusted. No company has hesitated in honoring our reports of actual damage.

Many ask, "Is it possible to assess positively the damage allegedly done by a boom?" The answer is "Yes." We have done it in hundreds of cases. In making such assessment, I rely 80% on 37 years of intense and extremely varied training and experience in construction and 20% on two years' experience evaluating concussion damage in Europe in World War II. These assessments are positive enough to hold in court, granting that they are piloted by a good attorney.

Where cooperation is needed

It would be a mistake for the aviation industry and the air transportation organizations to shrug this matter off as just another bothersome detail to be passed over to their insurance carriers for processing. Such action could result in loss of millions in increased insurance rates. Thoughtful cooperation and joint planning by the aviation industry and the insurance carriers is needed and will pay off.

The Oklahoma City situation proved that there is always some insurance-adjusting organization which, for one reason or another, is a bit too anxious to settle unjust claims. This unbalances other such organizations working on the same project and makes it more difficult for them to obtain fair and equitable settlements. The final result is that the insurance actuaries take cognizance of events and later the rates reflect the sum situation.

It is important that the aviation industry have some of its own members involved in all such situations, and also engage vibration damage specialists to instruct and counsel it, if for no other reason than to enable them to sit in intelligently on the insurance meetings. In the long run the monetary saving will be tremendous.

It is realized that these various facets of the sonic boom situation are complicated and difficult enough to attain. Nevertheless, one more important "ingredient" must be added and kept constantly in mind or all else may be found to be completely useless. This is the law and its bearing on your particular case.

To the scientific man, the fact that a phenomenon can be proved or disproved scientifically is all important. In a court this may have little or no importance. The judge may not, and often does not, permit the scientific proof to be entered in the record. All scientific calculations on sonic boom damage must be gathered, organized, and presented in strict accordance with the legal rules of evidence, not only from the broad national standpoint, but also taking into consideration local usages and the interpretation particular judges will give to the rules of evidence.

This, of course, requires some knowledge of the law and an early and close cooperation with the attorneys who may be later retained in the matter. The court is the payoff, both literally and figuratively, and all claims should be processed as if they will eventually end up in litigation.

This is the surest way to avoid such eventuality.

President nominates Gen. Twining to succeed Adm. Radford as Chairman of JCS

Twining

Quarles

Douglas

White

Gen. Nathan Twining, Air Force chief of staff, has been nominated by President Eisenhower to succeed Adm. Arthur Radford as Chairman of the Joint Chiefs of Staff. Admiral Radford's term expires August 15.

General Twining's appointment is the first that an Air Force officer has received for the two-year term as head of the JCS since the post was created in 1948

In addition to the Twining nomination, President Eisenhower also named Donald Quarles, Air Force Secretary, to the position of Deputy Defense Secretary, succeeding Reuben Robertson, Jr. The latter is scheduled to resign April 25.

Replacing Quarles as AF Secretary will be James H. Douglas, currently holding the position of Under Secretary of the Air Force.

Gen. Thomas D. White was picked to replace Gen. Twining as Air Force Chief of Staff.

The White House also asked Senate approval of the re-appointment of Adm. Arleigh Burke as Chief of Naval Operations for another two-year term beginning August 17. No extension was asked for Gen. Maxwell Taylor whose term as Army Chief of Staff runs to June 30, 1959. No successors for Gen. White or Under Secretary Douglas were proposed.

New ejection seat to give pilots better protection

Chance Vought Aircraft, Inc. has developed an ejection seat designed to give Navy pilots greater protection during hard landings in jet aircraft.

Feature is a stainless steel strap in the rear of the seat which reduces the g-forces encountered during landing contact with the ground or carrier deck. The top end of the strap is fastened to a fuselage bulkhead and the bottom end to the seat support. The strap stretches several inches during hard landings.

Another feature is a foamed plastic seat cushion contoured to prevent the pilot's hips from sliding forward. The forward portion of the cushion also supports the thighs during ejection.

Seats are installed in Chance Vought's F7U-3 Cutlasses and other Navy aircraft.

Construction of new airport under way in Dallas

Groundbreaking ceremonies on March 16 launched construction of the $1,291,000 Addison Airport at Dallas, Texas. The facility, termed the world's first completely executive base, will have a 4,500-by-100-ft. hard surface runway, a 5,000-sq.-ft. terminal building with restaurant and other facilities, and hangars for storage and repair. Airport management plans to keep the field open on a 24-hour basis.

AMERICAN AIRLINES FLEET NOW 100% EQUIPPED WITH BENDIX IGNITION ANALYZERS!

We are very proud that American Airlines has chosen the Bendix* Ignition Analyzer as the standard equipment for its entire fleet of aircraft. On American's four-engine aircraft the analyzer is permanently installed as airborne equipment. Two-engine aircraft are prepared for portable-airborne analyzer usage.

American Airlines has used the Bendix Ignition Analyzer for quite some time. The decision to prepare the entire fleet of aircraft for use with this analyzer was made after long usage had shown this to be the most suitable equipment for American's requirements.

Major airlines, military services, and corporate aircraft operators have found the Bendix Ignition Analyzer to be a vital and almost indispensable piece of equipment to reduce costs by improving maintenance and operating efficiency. The analyzer plays an important role in reducing en route and turn-around delays, thus improving customer convenience and satisfaction.

The Bendix Ignition Analyzer is a sound investment that will pay for itself within a short period. We would be pleased to provide complete information as to the most convenient and economical analyzer installation for your aircraft.

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Renegotiation: industry ready to fight on principle

Millions of dollars at stake in U.S. Tax Court battles against arbitrary decisions of Renegotiation Board

TENS OF MILLIONS of dollars in hard-won aircraft profits are at stake in the suits against the Renegotiation Board pending and expected in the U.S. Tax Court.

When the Board, in its arbitrary way, took aircraft money in past years, most of the companies forfeited their right to appeal rather than risk further losses by adverse decisions.

Now their dander is up. Indication is that several will fight. Also there is growing insistence among defense industries that the Renegotiation Act of 1951 shall not be extended past its expiration date at the end of 1958.

How production is being hampered

Progress and efficiency in military production are being stifled by the arbitrary removal of profit incentives under a wartime law that has a doubtful place in peacetime.

This outline of the little-known renegotiation process is offered as a service to defense industries trying to make Washington understand their problem.

Billions taken

Through 1956, more than $1 billion in "excessive" profits was taken from defense industries. That is not the half of it.

The Board, now midway in its work for these years, expects to recover another billion. Close to a billion more may be seized for the unfinished period before the law expires.

How much is from aviation no one will say. Total contract volume involved in recoveries to date was $136 billion. About a third was for aircraft engines, and related electronic items.

A company can lose nearly as much to renegotiation in a year as the stockholders get.

The way it works is not widely known except to company auditors, comptrollers and accountants. The facts, as far as the secretive Board lets them out, are scattered through hundreds of pages of hearings and reports.

How it works

If changes are to be sought in Washington, the complex process has to be reduced to a simple story. Here is a quick outline.

Renegotiation is the Government's means of recovering profits found to be excessive, from contracts over $1 million per year with the armed forces and several other agencies.

The Acts of 1942 and 1943 got World War II production going on an adjustable price basis. The law lapsed at the end of 1945 and was renewed in 1948, largely for aircraft.

After Korea boomed production, the 1951 law set up a 5-man board for contracts over $250,000. This floor was raised to $500,000 and later to $1 million. The Act was three times extended with presidential and Defense backing.

The contractor files a year's statement with the Renegotiation Board and is cleared of liability if all is in order. Otherwise the case goes to one of three regional boards.

If an excessive profit is found, the payment usually is settled by agreement. If not, the Board issues an order. The company must pay but may sue for recovery in the Tax Court.

Time to file

Companies that keep books on the calendar year basis are now working to file their annual reports in May. Others are due five months after the end of the company's fiscal year.

Filing is not mandatory. The advantage is that the Board has to proceed within a year if a report is made. If profits case is not begun in that time, the company is permanently free of liability unless fraud can be proved.

The Board staff in Washington screens each statement and sends a letter of "withholding" in each case where it can be readily determined that there was no excessive profit. Of 7,000 filings last year, three-quarters were thus withheld and cleared.

Cases not withheld in the Washington screening go to the respective regional board. There were six such boards to begin with; now four are being cut to three. The present sites are at Los Angeles, New York and Detroit, plus Chicago, which is being closed.

Class B cases, under $800,000, may be settled in the regions, or appealed to the main board. The larger Class A cases go to Washington where the bite, as set in the regional office, may be reduced or increased.

Out of 50,000 filings so far, 2,800 determinations of excess profits have been found. In some 2,600 of these cases, the contractors chose to settle through bilateral agreement with the Board. Where no agreement is reached, the Board slaps down a unilateral order.

In either case, the company has to pay what the Board says, less the amount previously paid in taxes on this sum. For example, if the excessive profit was found to be $1 million and the taxes on this sum were $520,000, the company would pay $480,000.

The money is paid to the branch of service for which the work was done—Army, Navy, or Air Force. The services simply act as a collecting agency for payment into the general funds of the Treasury.

Nobody wins

To get back any of the lost profits, a company can appeal within 90 days to the U.S. Tax Court in Washington. Such cases are on a *de novo* status; they start like new.

The Tax Court makes its own determination of excessive profits. The figure may be less than what the Renegotiation Board found. Or it can be more. Few have risked this two-edged appeal.

Only 30 cases have been started in the Tax Court and the Board has not yet lost a single one.

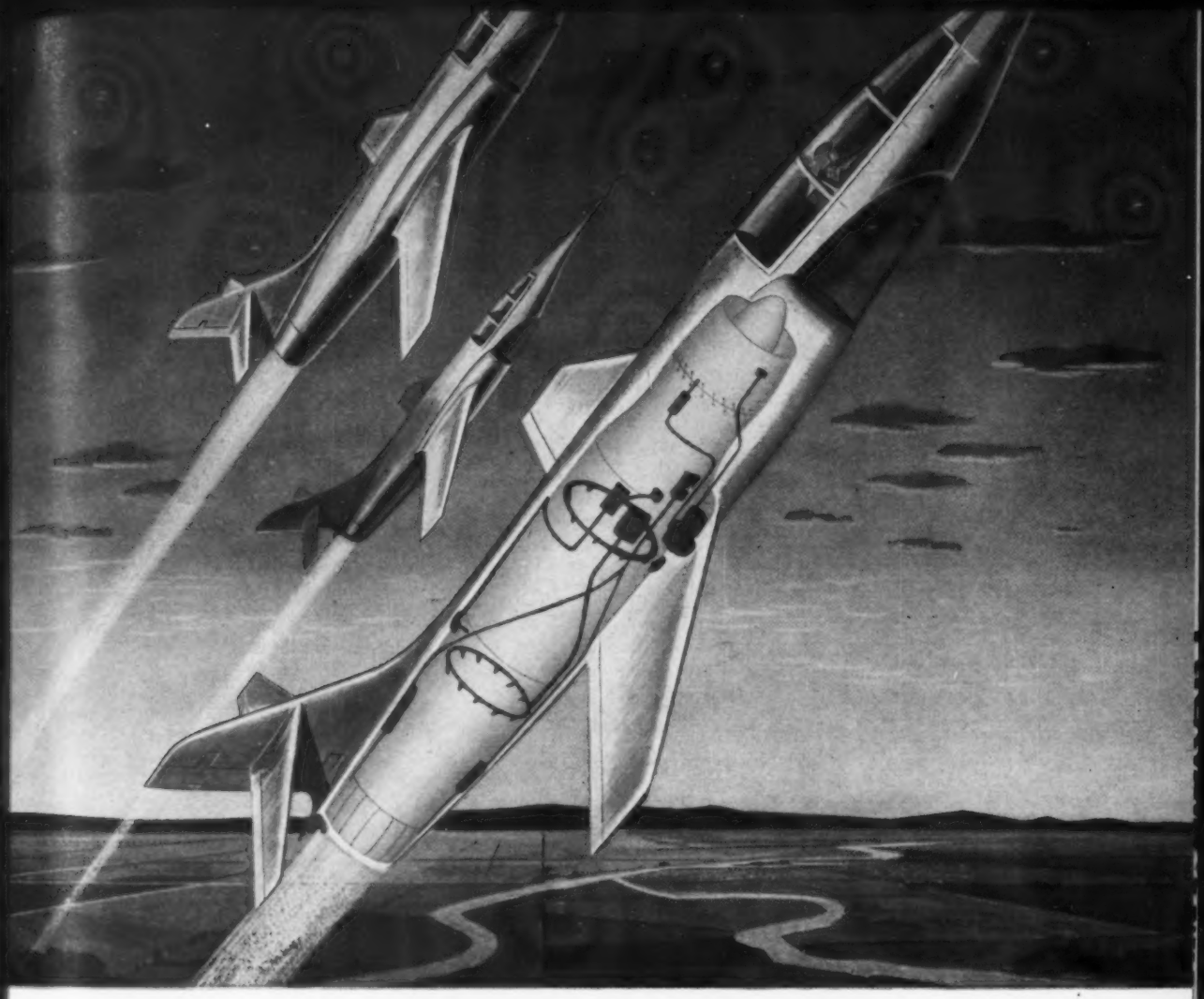
Industry has been at the mercy of the Board, its regional boards and their staffs of accountants and investigators. The guide lines in the law for determining excessive profits are very loose. So these few federal men have wide rein in deciding how much to extract from a company or an industry engaged in the defense of our nation.

Incentive robbed

Some idea of the effect may be seen in the case of Boeing Airplane Co. In a 1952 sales volume of $717 million in round numbers, the renegotiable earnings before taxes were $54 million.

The Board found excessive profits of $9.8 million. Boeing had to pay $2.9 million as the net refund after tax credits. This compares with dividends of $4.3 million that year. The company was dependent on the Government for 99.7% of its income.

Now note that Boeing worked under the fixed-price incentive-type contract in which a reasonable price is set



TOWARD MACH 3

WITH A COMPLETE BENDIX SYSTEM FOR FUEL METERING AND ENGINE CONTROL

When the pilot swings the lever from idle to emergency thrust—or back again—things must happen fast in the big jets.

But not too fast!

For, pouring it on, or cutting back faster than the engine can take it, spells disaster. The penalties are ruinous over-temperatures, compressor stall or flame-out.

When the pilot orders a change in thrust, the Bendix* fuel metering and engine control system takes over. Fuel feed is automatically computed and scheduled. Geometric controls such as exhaust nozzle area and inlet vane angles are set. Automatically and instantly, engine response is crowded to the limit—but not beyond!

Matched sets of Bendix components—pressure and temperature sensors, electronic amplifiers, fuel metering units and engine control actuators—work together as a *system*, spanning the length and girth of the engine.

Bendix components, designed and engineered together, invariably give more efficient performance than any arbitrarily assembled system.

And there is the further important advantage of having one source and having that source completely responsible for over-all dependable operation on the plane.

So, when it comes to fuel metering and engine controls, think of a complete and integrated system. Then we suggest you think of Bendix and the Bendix Products Division.

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Bendix PRODUCTS DIVISION **South Bend,** IND.

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LEAR MARS

(Master Attitude Reference System)

WITH INTERNAL LIGHTING

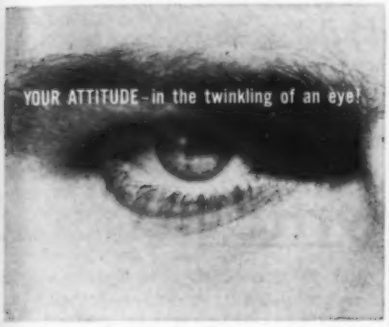
Smaller, lighter, more accurate, more flexible, more reliable, and more readable—the new LEAR MARS obsoletes any other attitude reference system in the air.

LEAR INC., GRAND RAPIDS DIVISION
GRAND RAPIDS, MICHIGAN
IP-16

MARS

Master Attitude Reference System

Developed in cooperation with Wright Air Development Center



The new Lear MARS is a light weight pictorial attitude reference system whose exceptional accuracy makes it highly applicable to all supersonic, subsonic, and helicopter aircraft types. It is an all A-C system and available with either 3-inch or 5-inch indicator.

MARS FEATURES:

INTERNAL LIGHTING—Unique Lear internal lighting eliminates pilot blinding glare, stray light, canopy reflections and protruding fixtures. Translucent background sphere and indices glow uniformly with red light.

INTEGRAL TRANSISTOR AMPLIFIER—Hermetically sealed indicator contains miniaturized amplifier which operates directly from standard synchros. Silicon transistors and printed circuitry provide unequalled miniaturization, improved reliability, and low power consumption.

MASTER REFERENCE—Remote mounted MARS control can also serve as master reference for other systems requiring an accurate vertical reference.

PERFORMANCE—New steel gyro and system design innovations provide marked improvement over previous systems in sensitivity, accuracy, reliability, and life. Very short initial erection cycle facilitates fighter scrambles.

PACKAGING—If indicator mounting space is critical, the integral amplifier may be packaged separately, thereby shortening indicator length to 6 inches. Remote rate gyro package provides further installation flexibility.

ACCEPTANCE—MARS will be standard on such new aircraft as the Lockheed F-104, Chance Vought F8U-1, and Sikorsky HSS-1.

For detailed product data sheets, write to the Grand Rapids Division, Grand Rapids, Michigan.

LEAR

Circle No. 10 on Reader Service Card.

at the beginning with the proviso that if, by extra efficiency, the cost can be cut below that figure, then the contractor can keep part of the saving.

Generous old Uncle Sugar gets 80% and the company keeps 20%. Boeing people say that almost all the $9.8 million snatch was earned in this way by doing a better job. What incentive is left to the workers, they ask, to sweat for efficiency in years to come?

For less than $3 million, the Government has struck a blow at the future pace of operations that run in the magnitude of three-quarters of a billion!

Uncertainty prevails

Since the Board is still considering some of the largest redeterminable contract cases of 1953, industry is kept in uncertainty for years.

In the words of last year's report on aircraft profits by the House Armed Services subcommittee headed by Rep. F. Edward Hebert (D-La.):

"We think it inexcusable to allow statutory renegotiation to be four years behind. If more help is needed, it should be requested and granted. To delay timely determination of profits for as much as four years is unfair to the government and unfair to the contractors who are expected to plan for the future."

But the Board's budget for next fiscal year is being cut by congressmen who, at the same time, praise the Board for returning money to the Treasury.

While congressmen responsible for defense worry about the adverse effects of renegotiation, those concerned with appropriations and finance see mainly the dollar figures. In the recovery of the first billion—gross before taxes—the Board's expenses were $21.7 million, through the end of 1956.

But there is much evidence that use of a wartime panic measure will cost the nation far more in peacetime than it returns.—**K.K.H.**

CAB unable to explain United DC-4 accident

Civil Aeronautics Board has issued its formal report on the October 6 crash of a DC-4 into Medicine Bow Peak, Wyo., with no tangible evidence as to what caused the accident.

Board said the probable cause was pilot deviation from the planned Denver-to-Salt Lake City route for some unknown reason. Although considerable discussion was devoted to the possibility the pilot had chosen an off-route "short-cut" or had become incapacitated, CAB could not establish either as definite contributing factors in the accident.

Camera to save Lockheed $120,000 in blueprint costs

Lockheed Aircraft Corp. anticipates savings of about $120,000 a year in blueprint costs through purchase of a $25,000 Peerless Neo-Flow camera and processor that will allow all drawings to be reproduced in half-scale size.

Half-scale blueprints are considered acceptable in the aircraft industry today as equal in quality to the larger drawings and enable savings to be made in storage space, reproduction costs and ease in handling. The new camera, scheduled for delivery this summer, will be installed at Lockheed's Factory A-1 in Burbank.

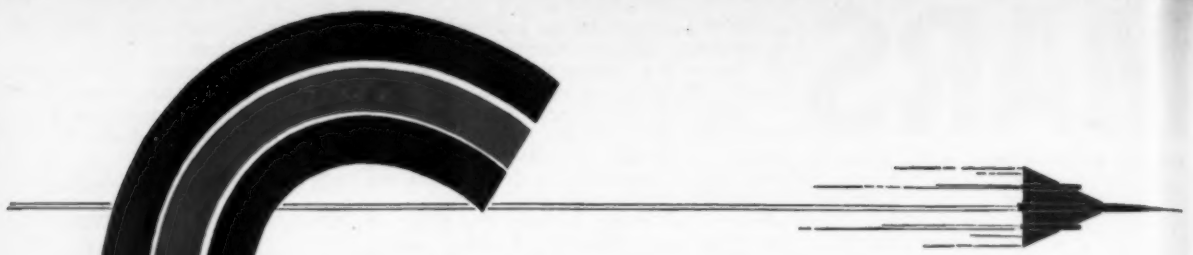
B-36 carries B-38 airframe 950 miles

Airframe of the supersonic Convair B-58 Hustler was carried beneath the belly of a B-36 in a flight last month from Fort Worth, Tex. to Wright-Patterson AFB, Dayton, Ohio, where it will undergo extensive static tests.

The non-stop flight of 950 miles was made in four and a half hours. Because of the unusual load, the B-36's two inboard propellers were removed and the flight made with four piston engines and four jets. Landing gear of the big bomber remained extended throughout the flight.

At Wright-Patterson, Hustler will undergo one of the most extensive static test programs ever developed, according to Convair.

Use of the B-36 to carry the B-58 airframe was based on economy; other transport methods would be much more costly, Convair officials explained.



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Hebert probers set sights on engine industry

by Charles Schaeffer

HOUSE INVESTIGATORS, under Louisiana Democrat F. Edward Hebert, are methodically setting the stage for a penetrating probe of the aircraft engine industry. Hebert, who views the query as an encore to last year's comprehensive airframe investigation, predicts "tremendous" savings for the government before he rings down the final curtain this summer.

Specifically, the Armed Services Investigations Subcommittee wants to know whether:

Manufacturers reap excessive profits from the Government.

Air Force and Navy bargain sharply enough in engine procurements.

Current contracts adequately protect the best interest of the Government.

Simultaneously, Chairman Hebert claimed that the Government recovered $328,000,000 from the aircraft industry following the probe last year. Crediting the manufacturers, Hebert explained that officials voluntarily refunded the money—overpayments by the Air Force and Navy.

The looming appraisal is one phase of a broad study of Pentagon procurement, planned this year by Hebert. Initially, detailed multi-part questionnaires were mailed to 17 manufacturers. Returnable by May 13, the forms will disclose contract data ranging from total profit to company traveling expenses. The study, covering the years 1952-56, will even cover two firms now out of the aircraft engine business.

The rising cost of modern jet engines, Hebert said, has been troubling him for some time. "For example, the J57, a jet engine used to power the Air Force's B-52 intercontinental bombers, the KC-135 tankers, and the F-100 (Super Sabre), the F-101 (Voodoo) and the F-102 (Convair) supersonic fighters, cost from $125,000 to $150,000 each," Hebert said.

"When you progress to the J75, which is used in the F-105 (Republic) fighter bomber and the F-106 (Convair) supersonic interceptor and which will also power the Boeing and Douglas commercial jet airliners, the cost zooms to $250,000 per engine."

Navy engines vary in price from $62,800 for the J36 to as much as $253,000 for some models of the J57, Hebert said. He observed that the AF alone received more than 5,000 engines during calendar year 1956. A somewhat smaller quantity is projected for calendar year 1957. The Navy anticipates its deliveries of reciprocating engines in 1957 will reach nearly 1,000, plus a greater number of jet powerplants.

Significant, Hebert says, is the subcommittee approach that will permit engine manufacturers to relate their side of the story in the same manner airframe officials were questioned. The Louisiana legislator also said manufacturers could expect surprise subcommittee visits.

Hearings are scheduled to start in June, run for two months and encompass testimony of both civilian and military witnesses.

As he released details last week, Hebert was optimistic. "We anticipate that this investigation will bring about tremendous savings to the Government," he said. "On the basis of past experience, we believe a saving of 5% would be a very conservative estimate. That would be $100 million in this current fiscal year alone."

Hebert conceded that he plans no wholesale indictment of the engine makers, but warned that the record will be closely scrutinized.

Some questions committee wants answered

Here are some of the principal items from the two-part subcommittee questionnaire sent to the engine makers.

Questions Related to Specific Contracts

With respect to each separate contract for the articles enumerated, answer the following questions (partial list):

Government type or model number (identifying same by popular name, if any) being manufactured. Government contract number. Date of contract or letter of intent (indicate which). Type of contract (indicate whether price redetermination, cost plus, fixed price, or incentive type, research and development, etc.). Date when authorized to proceed.

Total contract price. Total Government payments received through fiscal 1956. Balance claimed or allowed (indicate which). Unit sales price agreed upon or claimed (indicate which).

Total dollar profit on contract. If estimated, state total estimated in dollars. If determined and allowed, state profit in dollars and percentage on contract. State profit per unit in dollars and percentage.

General Questions (use company's fiscal year accounting)

State the total sales of the company in each year commencing with 1952 through 1956.

State sales to United States Government in dollars and percentage of total for each year 1952 through 1956.

State the net worth of the company in 1952, 1953, 1954, 1955 and 1956.

State the amount of outstanding stock in 1952, 1953, 1954, 1955 and 1956.

State the dividends paid per share in each year since 1952.

State the amount of paid-in capital for 1952, 1953, 1954, 1955 and 1956.

State the amount of surplus in 1952, 1953, 1954, 1955 and 1956.

Furnish balance sheets and operating statements of company for years 1952, 1953, 1954, 1955 and 1956, specifically including profit (a) before taxes (b) after taxes.

Has your company been renegotiated in any year, 1952 through 1956? If your answer to this question is "yes," state the year or years and whether or not any determination of excessive profits was made, and the amount, whether a bilateral agreement was reached or unilateral action taken and whether an appeal has been taken.

State the dollar value of each United States Government research and development contract held by your company, identifying the same by contract symbol, indicating total payments and balance due on each contract.

State the amount the company claimed for depreciation on plants and personal property in each year 1952 through 1956. (In reporting on this item, advice whether Internal Revenue Service formula or company formula is used.)

State the amount claimed on the books of your company for amortization in each year 1952 through 1956.

State the amount retained by the company in each year from 1952 through 1956 as a reserve for refund or reimbursement to the Government on any contract.

State the amount of salary, bonuses, commissions or fees, or anything of value paid to any retired officer of the United States Military Establishment, giving name of individual, amount paid, dates paid since 1952, and state duties or services rendered.

State the total selling expenses of the company in each year, 1952 through 1956. Itemize each major selling expense, including advertising, by category as the same is carried on your books.

State the name, company duty, salary and/or bonus of every official of the company paid $25,000 or more, for each fiscal year.

State the value (giving source of determination, whether from Government or company books) and kind of Government-owned property, real or personal, if any, used by the company in the performance of: (a) Government contracts; (b) any private contracts being performed by the company, and give particulars as to contract and vendee.

State the rental, if any, paid on any item referred to in above question.

State in dollars and percentage the profit earned in each year 152 through 1956, inclusive: (a) before taxes; (b) after taxes.

Kellett's goal: Greater stability for helicopters

by Joseph S. Murphy

WILLOW GROVE, PA.—A $445,000 helicopter flight test program, under way here at Kellett Aircraft Corp.'s new 60,000 sq. ft. facility, may signal a major advance in helicopter flight stabilization.

Kellett is now in the process of modifying an Air Force Sikorsky H-19 and Navy-sponsored Vertol H-21, both under Army funding, to fit them with a mechanical gyro stabilizer system proved out by the company in its rocket-powered KH-15 one-man helicopter.

James T. Duffy, Jr., Kellett president, told AMERICAN AVIATION the timetable for first flight of the H-19 has been set for this month, with the H-21 to follow about a month later. Both aircraft will be fully instrumented to record flight test data and the actual test programs are expected to last about three months.

The mechanical gyro stabilizer system, combined with a newly developed tail system, answer to the knotty problem of making present-day helicopters sufficiently stable for flight under instrument conditions, without resorting to complex electronic control systems.

By taking advantage of the gyroscopic forces of a weighted stabilizer bar driven on the same shaft that powers the main rotor—in conjunction with the inertial and aerodynamic forces on an unbalanced horizontal tail surface—Kellett introduces a finely-computed percentage of these forces into the pilot's control system via mixing linkages.

Pilot's Job Made Easier

The net result is that the pilot is freed from the arduous task of manually correcting for each slight gust and resulting pitch or roll condition experienced in normal flight.

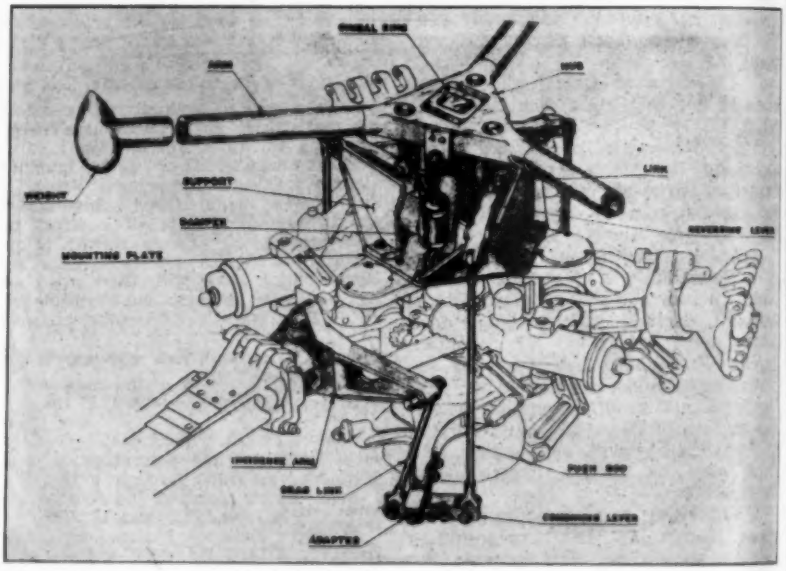
In both the H-19 and H-21 installations, the gyro stabilizer bar will be mounted above the rotor with its three weighted arms staggered between the rotor blades. The H-21, being a tandem rotor type, will have the stabilizer on the forward rotor system only, but will introduce the corrective information to both rotor control systems.

On the H-19, a single rotor design, the corrective input from the stabilizer is introduced directly into the cyclic pitch control system. Although final calculations of system weight have not been made pending completion of the test installation, Kellett engineers estimate it will be about 70 pounds.

The bob-weight actuated tail developed by Kellett will be fitted to the H-19 for the tests. This system (see schematic diagram) is designed to improve stability under high-speed flight conditions, whereas the gyro stabilizer proves its worth under low-speed and hover conditions.

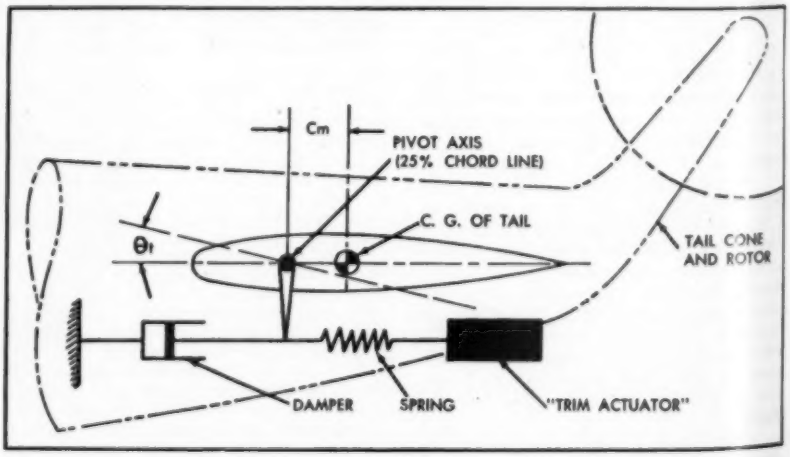
The H-21 test program, being sponsored by the Navy, will use an Army helicopter on loan to Kellett and is considered an extension of the stabilizer evaluation program to tandem rotor types. In this installation, expected to weigh in the neighborhood of 120 lbs., Kellett faces the complication of adapting mechanical stabilization to a model having a big difference in longitudinal and lateral moments of interia.

In tandem rotor types, Kellett engineers estimate, the longitudinal moments (pitching) run in the order of four to five times those of roll.



DETAILED SKETCH of gyro stabilizer system in USAF Sikorsky H-19 (commercial S-55). Weighted gyro bar is mounted above main rotor, introduces corrective forces into H-19's cyclic pitch control system.

BOB-WEIGHT actuated tail for H-19 improves stability in high speed flight.



Here, the Kellett system now under development will feed inputs from the stabilizer into both the longitudinal and lateral systems. For the longitudinal control, the input is fed into the differential collective control for the front and rear rotor, giving a powerful response. For the lateral control system, the input is introduced into the cyclic control for both rotors.

In both instances, the input from the gyro stabilizer is boosted hydraulically before linking to the helicopter control system. And, in all instances, in both the H-19 and H-21 systems, the corrective forces supplied by the stabilizer will be integrated into the control system without moving the pilot's stick control.

Credit for origination of the gyro stabilizer is not Kellett's but belongs to Arthur Young, retired engineer who developed the idea on small models. The use of the bob-weight tail originated with Kellett engineers.

In addition to the helicopter flight test project, Kellett has stepped up activity in both R&D work and subcontracting since its move from Camden last October. According to president Duffy, business in January was equal to that for six months during 1956 and promises in 1957 to double or triple that for the full year of '56.

Big project eyed by Duffy, but not yet backed by Army funds, involves a tilt-wing VTOL design the company came up with, and for which a preliminary study has been completed for the Army's Transportation Corps.

Although details have not yet been released, it is understood this design utilizes a tilt-wing concept in which the two rotors, powered by a Lycoming T53 turboprop, assume the cyclic pitch characteristics of rotors while in hovering flight and during transition and the controllable pitch features of propellers when in horizontal flight.

Besides the VTOL project, Kellett is competing in the Army's flying jeep design study and one other design study competition on which details remain classified.

High point in its expanded subcontracting was reached recently when it won awards from Bell Aircraft Corp., Republic Aviation and Douglas, and for the first time listed missile parts subcontracting among its activities.

Stickers used to educate employes about titanium

North American Aviation is using stickers in a titanium education program aimed at making all personnel handling the material aware of its cost and the need to make every effort to conserve it.

Stickers are used on all titanium sheet stock and large parts of pure titanium and titanium alloy.

New jet silencers used at Norton AFB

TWO OF General Sound Controls' Model N-400 jet runup silencers in use at Norton AFB, San Bernadino, Calif. Nose wheel trough is used for F-100 operation to raise the tailpipe level to that of the quick-disconnect muffler on silencer. For F-102 runups, trough is covered by a steel plate.

Designed specifically for ground runups on afterburner-equipped, J-57-powered F-100 and F-102 fighters, two new-type jet silencers have been installed at Norton AFB, San Bernardino, Calif.

Manufactured by General Sound Control, Inc., Los Angeles, the units are said to reduce the noise level of full power operation to 95db at a distance of 250 feet from the source—approximately the same level encountered inside the average low-priced car at 70 to 80 mph highway speeds.

Prefabricated for ease of shipment and assembly, the units may be carried by rail, truck or large air cargo carrier. Modular design allows for future expansion of the silencers to handle larger engines as well as reducing cost of the unit.

Mounted on a one-foot-thick cement slab, the silencers use General Sound's coaxial flow design in conjunction with automatically controlled water sprays and rapid mixing with cool air to reduce the 3500°F afterburner exhaust temperature to a final silencer exhaust temperature of 250°F.

Thermostatic control of the water spray reduces the amount of water used, making the silencers adaptable for areas with critical water supplies. a sump is also provided and residual water may be recovered and returned to the storage tank.

Designated as Model N-400 by the manufacturer, the silencer has been tested and accepted by Wright Air Development Center and may be ordered by military units under Class 19A of the Air Materiel Command's "Unit Allowance List" of technical equipment. Cost of the silencer in the Southern California area is $75,000, exclusive of the water tank and slab.

Automatic drilling speeds work on SeaMaster

The Martin Co. is using refrigerated slug-type rivets in automatic drilling and riveting operations during fabrication of P6M SeaMaster's wet wing.

Martin uses a new Drivmatic machine to drill and rivet stringers to the 10x37-ft. wing panels of the jet water-based bomber. The procedure is said to be seven times faster than the manual method. No sealant or rivet sleeve is necessary and the wing itself can be used as a fuel tank without the need of liners or secondary fuel containers.

The machine clamps the parts in position, drills and countersinks the rivet hole, injects the ice-box slug rivet, upsets the ends of the rivet and mills the top head flush with the wing surface.

The operation is controlled by a tape command device using standard 35-mm movie film with coded holes punched in it.

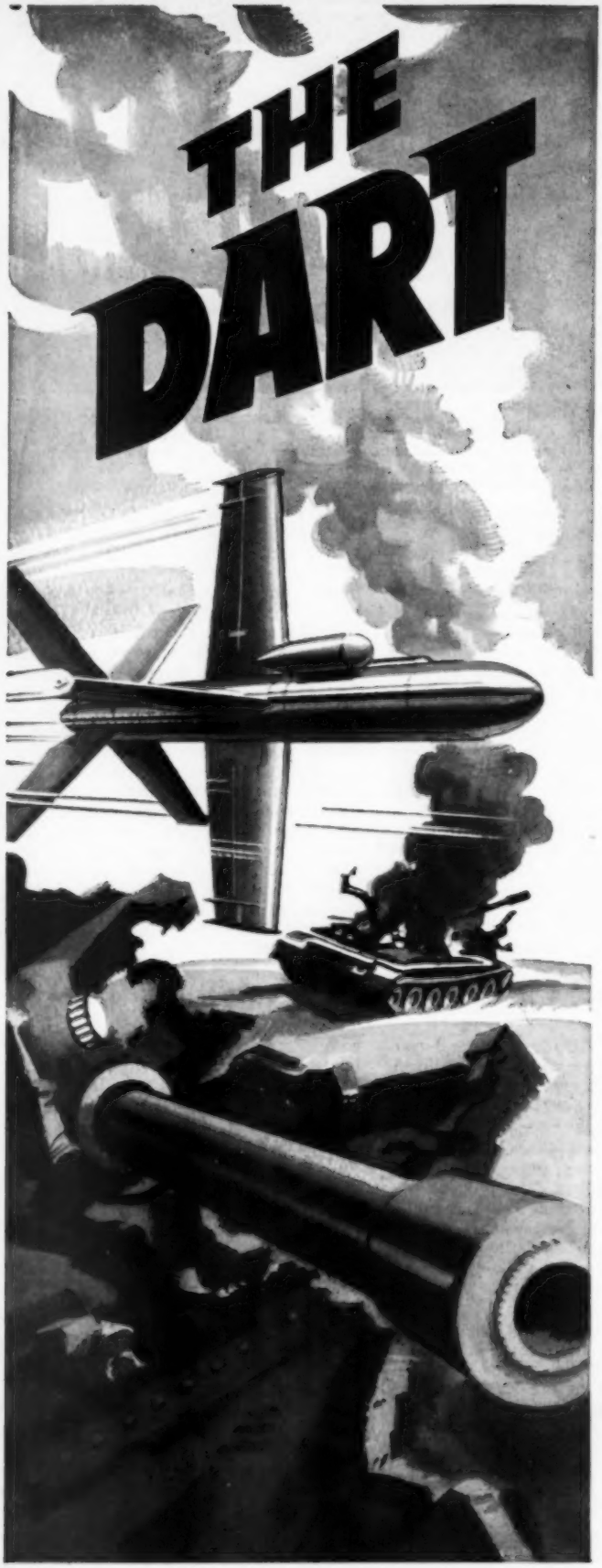
The slug rivets are straight rods of 2024 aluminum alloy cut to length with ends squared and chamfered. Rivets are heat treated, stored at —20° F, and must be used within 20 minutes from the time they are removed from the refrigerator.

Rivets are first squeezed and vibrated by the Drivmatic machine and inserted in restricted insertion spaces. The machine applies a 1,500-lb. clamp during riveting.

Components of the Drivmatic are mounted on a steel C-frame 12 ft. high with a 10-ft. jaw depth. Lower ram of C-frame heads the bottom of the slug rivet, provides high pressure clamp, and incorporates a profiling mechanism which automatically controls edge distance along the stringer.

The upper head contains the drill spindle, mill spindle, rivet gun and injector fingers.

A handling frame guides the parts to exact drill and rivet locations. It moves in vertical, transverse, longitudinal and radial planes. Control of each extremity is independent, permitting parts to be located in any position.



Rocket-propelled SURFACE MISSILE gives wings to ground combat

The fast and powerful Dart is a rocket-propelled surface-to-surface missile designed for Army Ordnance by the Aerophysics Development Corporation, a subsidiary of Curtiss-Wright.

While its design and performance are classified, the Dart has been described as a simple but effective anti-tank missile—a single hit from which would probably destroy a heavily armored tank. The five-foot long, highly maneuverable missile has a smokeless-propellant rocket motor.

The Dart represents one of the Army's most advanced ground combat weapons. Another development in the Curtiss-Wright propulsion family, it is typical of Curtiss-Wright's leadership in power to preserve peace.

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Navy WV-2s lick weather over North Atlantic

Average of 3.7 'Barrier Atlantic' missions flown every 24 hours in continuous radar watch since July 1, 1956

by Henry T. Simmons

The Navy revealed last month that its Lockheed WV-2 picket planes have maintained a continuous radar watch of the North Atlantic approaches to the U.S. since July 1.

Navy pilots stationed at Argentia, Newfoundland, have flown their bulging Super-Connies on more than 1,000 "Barrier Atlantic" missions since the operation got under way—an average of 3.7 missions every 24 hours, regardless of weather. Their objective: to give the earliest possible warning of any attempt by Soviet aircraft or submarines to jab the nation in the flank.

Most of the details of the far-flung Barrier remained shrouded from the eyes of reporters who visited Argentia last month. The Navy flatly refused to discuss the strength of its operation, the location and pattern of Barrier flights or even the additional warning time which the Barrier can provide the Continental Air Defense Command in Denver. Nevertheless, reporters were given a fascinating picture of the nature and difficulties inherent in the Barrier operation.

Weather major obstacle

Commander of the Navy's first airborne early warning wing is Capt. J. C. Clifton, former All-American at Annapolis. His command consists of three squadrons, VW 11, VW 13 and VW 15, which rotate between Argentia and Patuxent River NAS, Md.

Despite the incredibly bad weather which prevails at Argentia most of the time, Capt. Clifton can boast of a perfect safety record without a single major accident to man or aircraft since the Barrier was established.

The weather, in fact, is the major obstacle in maintaining the Barrier intact. Last July, for example, sub-GCA conditions prevailed 45% of the time; on 17 occasions the overloaded radar planes (they gross 141,000 pounds on take-off against 133,000 for the airlines) took off in zero-zero conditions.

Since no landings are authorized at Argentia below GCA minimums—200 feet ceiling and one-quarter of a mile visibility—the WV-2's returning from their lonely missions over the North Atlantic are frequently faced with the problems of where to roost when Argentia is socked in solid.

Fortunately, there are seven alternate airdromes in the area, three of them on Newfoundland itself. They are Harmon AFB, Gander and Torbay—all on Newfoundland—and Goose Bay, Labrador, Sydney, on Cape Breton Island, Halifax, Nova Scotia, and Summerside on Prince Edward Island.

All the alternates are within 450 miles of Argentia and usually at least one will remain above GCA minimums when the others are closed. The weather changes so fast, however, that it may be necessary for the picket planes to go even further afield in search of landing places. The Barrier men say they can route the WV-2s back to Rhode Island or even Patuxent or Norfolk if careful pre-briefing is undertaken before the missions.

ADM. WRIGHT monitors contacts.

Fog is by no means the only troublesome aspect of Newfoundland weather. Snow, for example, comes horizontally rather than vertically on the island. Drifts are so bad that the entire flight line personnel must turn out to clear the clogged runways. The doors of one of the hangars had to be changed because the snow drifts which occasionally piled up against them were too heavy for the motors to push aside.

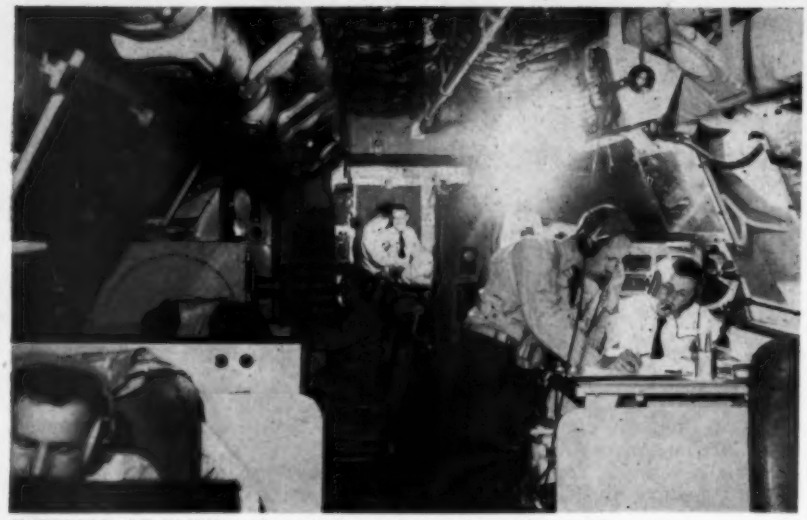
Despite the troubles of fog and snow, Newfoundland veterans say they are relatively minor annoyances compared to the problem of wind. To keep the Barrier intact, WV-2s have frequently taken off in winds of more than 58 mph, and one departed at night in a wind of 106 mph. On one occasion, a breeze of 161 mph was encountered at 4,000 feet over the base. The crosswind landing problem is also a joy, according to WV-2 pilots. They recall one occasion when a WV-2 landed in a broadside breeze of 34 mph.

With this background in mind, it's possible to appreciate their merriment over a minor accident report filed by an early warning squadron now going into operation in the Pacific. It seems the squadron incurred damage to one of its aircraft as a result of a taxi accident in a 31-mph wind. "It is expected that such accidents will cease after further experience in operating in high wind conditions," the report stated. Winds at Argentia average 29 mph or more 30% to 50% of the time, commented a meteorologist.

Average length of a WV-2 picket mission is 15 hours, but the big Turbo Compound-powered aircraft can remain aloft for as long as 19 hours if necessary. Flight and radar crew usually totals about 21 men. Radar equipment includes a large sweep radome in the aircraft's belly plus a smaller height-finding radar mounted atop the cabin. Five large and versatile consoles are available for the scanners and the Combat Intelligence Chief, plus a plot board and a station for the repair man.

The flying radar stations remain in constant contact with a control center at Argentia which, in turn, is linked to Atlantic Fleet headquarters at Norfolk, CONAD in Denver, and the

WV-2 TAKING OFF at Argentia, Nfld. for Barrier flight.



INTERIOR OF PICKET plane during early warning radar watch.

headquarters of the North East Air Command near St. Johns, Newfoundland. The system is designed to report contacts to the defensive command posts with an allowable lag of no more than eight minutes from the time of detection.

Not all contacts are reported, of course. Many are evaluated within the picket planes themselves in accordance with secret standards and are never sent back to Argentia. And Argentia control center evaluates a great many more in accordance with flight plans and other data available to it.

Interceptors Ready

As a general rule, however, an aircraft flying across the Atlantic on a course which will penetrate the U.S. Air Defense Identification Zone can expect to be questioned if it is more than 20 miles off its planned course, or 10 minutes off its planned time. If it can't satisfy the picket planes, it may expect an air intercept by Northrop F-89 rocket-firing fighters stationed at Harmon.

The Air Force also operates a radar picket plane similar to the WV-2. This is the RC-121F, used for "contiguous" patrols close to the shores of the country. They work with Navy blimps and Texas towers to maintain a close-in watch, as opposed to the far-ranging patterns flown by the Navy's Barrier Atlantic wing. Unlike the latter, however, they work directly under the operational control of Gen. Earle Partridge, CONAD commander. The Navy's early warning wing is responsible directly to Adm. Jerauld Wright, Commander in Chief of the Atlantic Fleet, but it is also required to support the continental defense mission of the Air Force.

The Navy plans to augment its early warning capability at Newfoundland in the near future. Officials were generally close-mouthed about this step, but it was apparent that it results, in part, at least, from increasing concern over the threat of Soviet submarines capable of firing guided missiles with nuclear warheads at U.S. coastal cities.

Last month, Adm. Wright consolidated all control of anti-submarine warfare (ASW) efforts of the Atlantic Fleet in the hands of Vice Adm. Frank Watkins.

In addition to placing all air, surface and sub-surface ASW efforts under Watkins, the move also gives him control of the seaward extension of the Distant Early Warning Line operated from Argentia. While this does not minimize Barrier Atlantic's task of supporting CONAD, it underscores its ASW role.

Five Air Force generals get new assignments

Change in assignments for five Air Materiel Command generals and retirement of another have been announced by the Air Force.

Maj. Gen. Thomas P. Gerrity, assistant for production programming, Deputy Chief of Staff, Materiel, will become commander of the Oklahoma City Air Materiel area, succeeding Maj. Gen. William O. Senter, who will become director, procurement and production, AMC, Wright-Patterson Air Force Base.

Gen. Senter replaces Maj. Gen. David H. Baker who, in turn, will succeed Maj. Gen. Daniel F. Callahan as assistant for programming, Deputy Chief of Staff for Operations, USAF headquarters.

Gen. Callahan will become commander of the Mobile Air Materiel Area at Brookley AFB, Ala., after Maj. Gen. Frederick R. Dent, Jr., retires in the spring.

Brig. Gen. Waymond A. Davis, director of procurement and production, Deputy Chief of Staff, Materiel will replace General Gerrity.

All the new assignments are effective in spring or summer.

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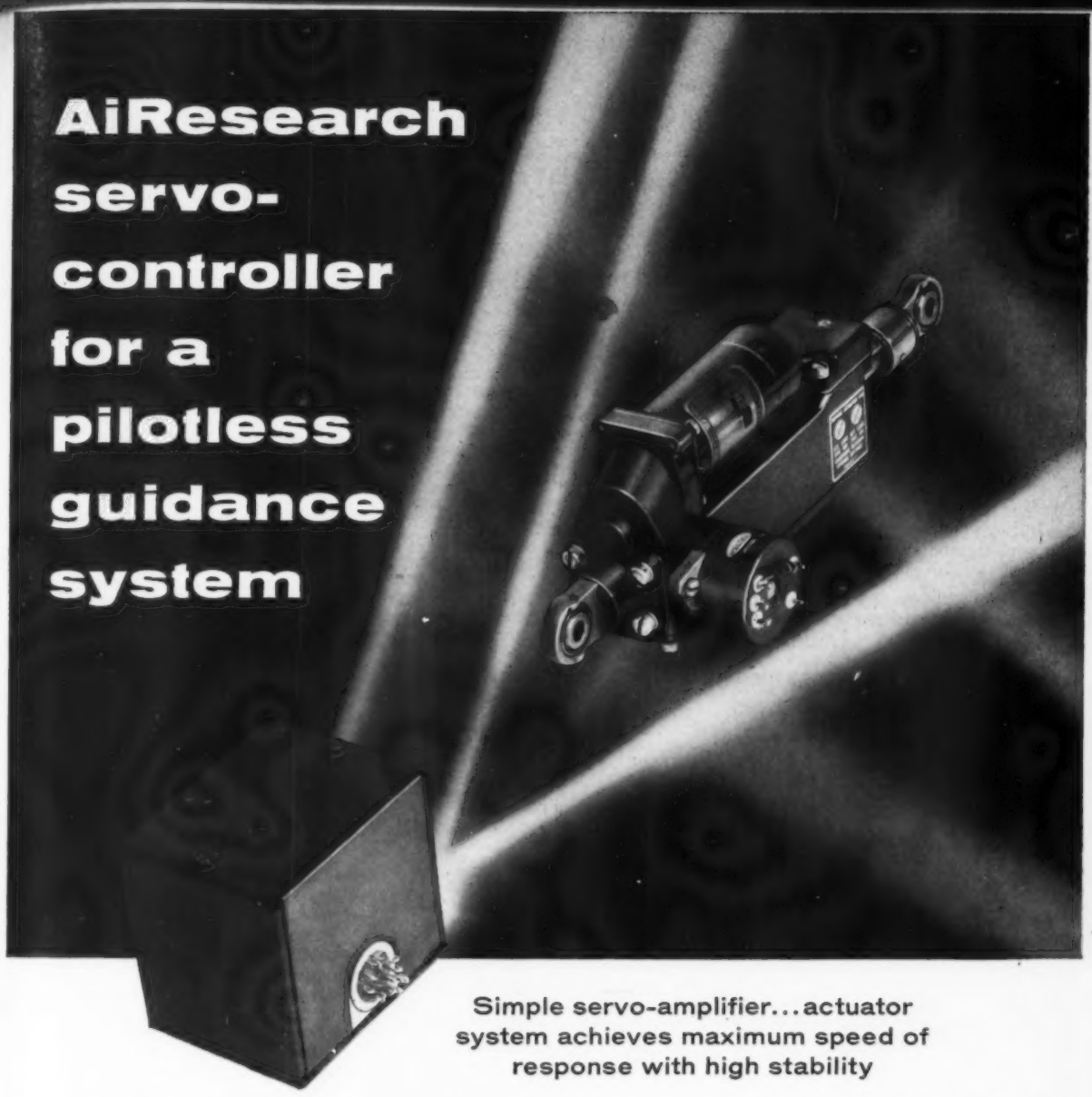
AiResearch servo-controller for a pilotless guidance system



Simple servo-amplifier...actuator system achieves maximum speed of response with high stability

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The servo-controller can operate from either a DC or AC power supply. It can also be designed to take signals from celestial, telemetering or pre-programming sources to maintain or readjust the course of its pilotless air vehicle. It is another example of the AiResearch Manufacturing Division's capability in the missile field.

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Circle No. 12 on Reader Service Card.

Navy blimp wins new life as air weapon

by Lois C. Philmus

THOUGHTS of administering the last rites to Navy blimps have been completely wiped out in a burst of new enthusiasm among Mach 2-minded policy makers. Recent successful demonstrations of the all-weather and endurance capabilities have re-inflated the balloons.

The very characteristics which touched off interment plans in recent years are the spark for the "new" thinking. Slow speeds, large size, and low-altitude features ideally suit the blimps to specific assignments for anti-submarine warfare and for filling in the gaps in the early-warning radar system.

An intensive three-year study of the blimp's all-weather stamina, directed by the Navy's Office of Naval Research, was brought to a climax last month. A Goodyear ZPG-2 anti-submarine airship, manned by a crew from South Weymouth Naval Air Station, Mass., broke all previous non-refueling endurance and range records. It was "masted" at Key West after covering 8,216 nautical miles in 11 days and 15 minutes, in a transatlantic flight.

While the new records hit the headlines, it was felt to be incidental to the basic mission which was to prove that modern non-rigid airships are capable of sustained flight without refueling under all types of weather conditions. The flight paved the way for introduction of a new Goodyear airship—the ZPG-3W—into radar picket duty, following first delivery in May of 1958.

Earlier in the year, five ZPG-2 and 2W airships maintained a barrier station about 200 miles off the North Atlantic Coast for 10 consecutive days. All types of weather conditions including icing, snow, sleet, rain, fog and winds as high as 60 knots reportedly were encountered without incident.

During the exercises, routine maintenance was performed from a mooring mast in temperatures which dropped below zero. Successful GCA approaches were executed, according to the Navy report, with ceilings below 200 feet and visibility at about 3/16 of a mile. Takeoffs with 100-foot ceilings were made in several instances.

In deciding to continue airships in operation, the Navymen did not overlook the minus side. Airships are unusually vulnerable to air attack, with little self defense possible. High winds are constant reminders that blimps are inflated balloons and can limit operations in the Arctic DEW Line areas under adverse conditions. But, in planning blimp missions, it is felt that capability of indefinite hovering, low fuel consumption and other characteristics balance the scales.

Navy blimps have been in continuous anti-submarine warfare service for some time. A fleet of about 50 currently is in operation, including the ZSG-4 (527,000 cu. ft. volume) and ZS2G-1 (650,000 cu. ft. vol.). Goodyear had built 12 of the newer ZPG-2 models before production was discontinued. About four are in the "W" or airborne early warning configuration.

Since the ZPG-2 was first developed in 1948, modifications and improvements have increased its capacity from 4,000 lbs. heavy takeoff to 12,000 lbs. About six months ago, four external fuel tanks were added which boosted fuel capacity up to 3,600 gallons. (The large airship burns about 10 gallons per hour on routine missions.) It cruises at about 50 knots and has a top speed of 70 knots.

The ASW version is described as a hunter-killer package. It carries standard radar tracking and sonar equipment. Armament includes depth charges and although classified, it is

NAVY'S AIRSHIP FAMILY. About 50 are in fleet service. All but four are on anti-submarine warfare assignments. The ZSG-2W is designed for airborne early warning missions with an advanced ZSG-3W scheduled to make its debut in May, 1958, for DEW Line service.

known to be able to fire "Lulu," Navy's atomic depth charge.

The AEW configuration is engineered so that the early-warning radar equipment is an integral part of the blimp's car, with no visible radome extending as on fixed-wing aircraft.

The early-warning potentials of the airship currently are the center of Navy planning. The lighter-than-air proponents are convinced that the new ZPG-3W will be able to replace the WV-2 on the DEW Line. Endurance in lieu of speed is the "crocker."

Approximate cost of the two AEW aircraft are believed comparable, estimated roughly at $2.6 million completely equipped. The lighter-than-air proponents feel they have a considerable edge on maintenance and operation. The airship is so designed that minor engine and envelope repairs can be made in-flight. Navy airship engines have a lift of 1,400 hours between overhauls and the airship itself can go for 34-36 months between major overhauls compared to a reported 18 months for the WV-2.

The resurrection of the airship has stimulated Navy research and development efforts. Although Goodyear remains the Navy's sole production contractor, development contracts have gone to new outside companies.

A new synthetic envelope of dacron and neoprene recently was developed by the General Development Corp. which will replace the present cotton and neoprene designs. The new envelope saves about 2,000 lbs. of weight and will have a longer life.

A new winch and carriage for in-flight remanning is under development by All-American Engineering Co. Operating from a service boat, the device will eliminate the "hairy" descent previously required in changing airship crews while in flight.

The winch couples automatically when contact is made from the airship installation to the master winch on the boat. Use of stronger, less flexible metals creates a less sharp angle at lower altitudes than was possible under older designs.

With the airship concept insured longevity, National Advisory Committee for Aeronautics and similar agencies are working on several studies for advanced airship and engine design. The U.S. apparently has an inexhaustable supply of helium, not available in comparable quantities in the rest of the world.

The modern airship is a far cry from the German designs that reaped such havoc. It features ballonets (air pockets) that empty and fill automatically as the helium expands and contracts at altitudes. Tricycle retractable landing gear permits taxiing and conventional landings and allows use of portable masting gear for simple and safe ground handling.

Simplified envelope construction permits transfer of the car low through two suspension systems. The load distribution system permits suspension of 40,000 or more pounds from the fabric. Internal suspension attaches to the top and external suspension to the sides of the envelope.

LATEST IMPROVEMENTS to the ZSG-2 include a four-fin installation in lieu of the original three fins for greater stability and addition of four external fuel tanks.

Saved by the sheer tenacity of the lighter-than-airmen, the blimp apparently has a unique place in aviation's supersonic future—whenever speed is not an asset.

AF approves increases in H-21 service periods

Increases in the service period of several components of the Vertol H-21 helicopter have been approved by Air Force.

In some instances the between-overhaul period has been doubled. Goal is 1,000 hours on all components.

Latest approved increases are based on the H-21's test experience covering an accumulated total of some 85,000 hours flight time. New service periods are: transmission 450 hrs., up from 250; rotor blades 750, up from 450; rotor hubs, up 450 from 200; rotor controls and swash plates, up 450 from 250.

Air Force plans to test new radio teletypewriter

Air Force is planning tests of a new airborne radio teletypewriter capable of use in relatively small aircraft. In tests to date, messages have been successfully transmitted between two of the 46-lb. machines.

Because of its relatively light weight, the teletype may be used in smaller aircraft. Current models of radio teletypes are so heavy and bulky that only large transports carry them.

Backlog for engines, props totals $18.3 billion

Value of backlog of orders reported by manufacturers of complete aircraft, aircraft engines and propellers at the end of the year was $18,363,000,000, 17% more than the total reported the year before, according to Census Bureau and the Civil Aeronautics Administration.

Orders for complete aircraft and parts comprises 64% of the backlog. Orders for U.S. military customers represents 75% of the aircraft backlog, 82% of aircraft engines and 76% of propellers.

During 1956 aircraft propellers and parts valued at $119 million were shipped by U.S. companies. Of this, 73% was for military aircraft, the report said.

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Electric tank teaches computers new tricks

by William Beller

RESEARCH AND DEVELOPMENT organizations with small budgets are avidly studying a French research device that costs less than $10,000. It is called the "rheoelectric analogy tank" by its innovator, Sorbonne professor of aeronautics Lucien C. Malavard.

The rheoelectric analogy tank combines the visual advantages of a smoke tunnel with some of the calculating abilities of a high-speed computer. In many instances, it can solve engineering problems that frustrate even our best calculators.

Prof. Malavard's tank can give engineers experimental foundations for their theoretical reasoning. It can help mathematicians avoid complete formulation of problems when general data are at hand. It can show aerodynamicists the principal characteristics of wing sections, blade lattices, streamlined bodies, air intakes, propellers and lifting surfaces.

Other applications include heat transfer and temperature field studies, and solutions of problems in elasticity, electronics, meteorology and icing. In icing, the tank is used to trace out ice trajectories and to calculate the ice-capturing coefficient of an object in an airstream.

Chief but by no means exclusive use of the device is in aerodynamics. The tank answers questions such as: How would clipping the tips off a delta wing affect the surface's lift distribution? What does the detailed air flow over a fairing, such as a cowling, look like? Current digital computers can accurately solve these problems only with great difficulty, if at all.

What it is

The tank consists of an insulated trough partially filled with an electrolyte. For this reason, it has also been called an "electric tank" or "electrolytic basin."

Tanks may have different forms. Occasionally, one is built for testing only a single design configuration. In this case, the tank's walls correspond to the boundaries of the region being studied. More commonly, the configuration, or model of one, is set in a tank of parallelopiped form.

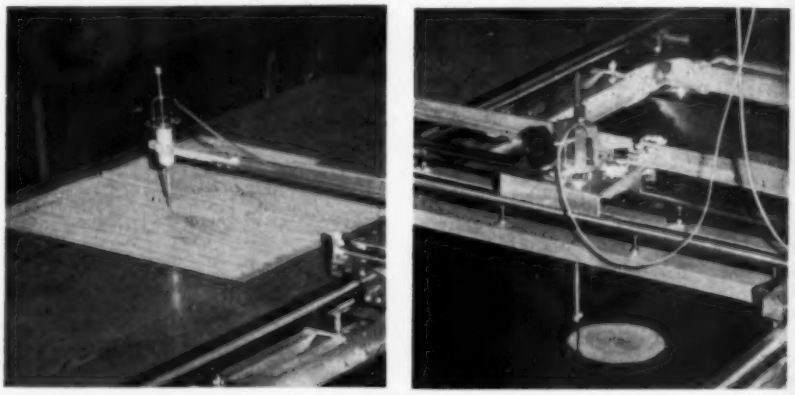
In most analog tanks, the conducting medium is liquid. It is usually a weak electrolyte, ordinary tap water rating high among the better ones. However, eletrolytes other than liquid are sometimes used. For rapid set-ups, a conducting paper can be used.

Although different conducting materials may be used, the analog techniques are based on the same principle: the analysis of the distribution of an electrical field in a continuous medium.

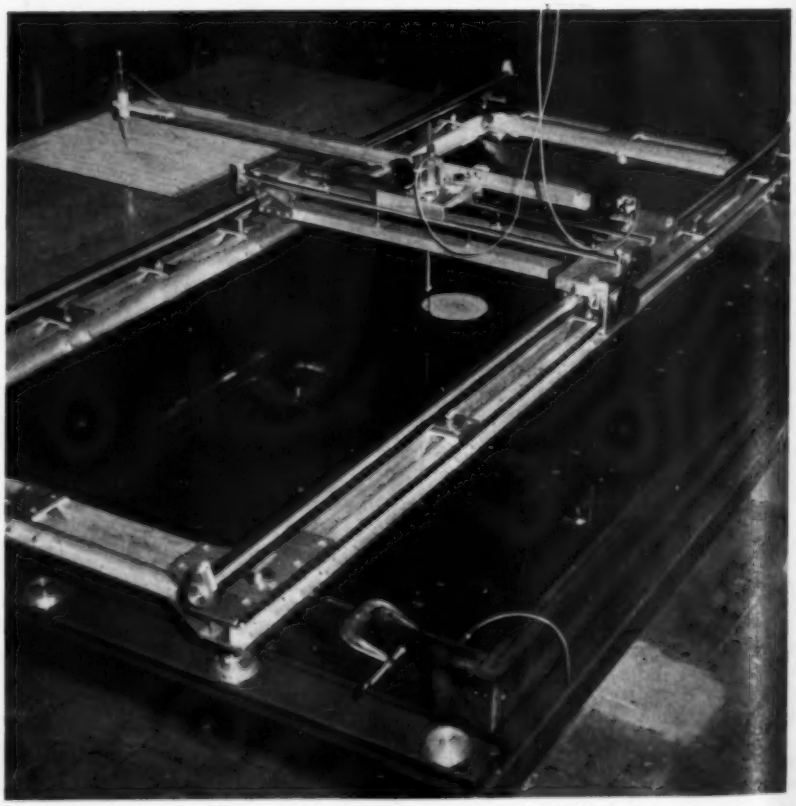
An electrical field is introduced into the tank by suitably placed electrodes. If a body such as an airfoil had been embedded in this field, the body's effect on the field can be measured by a probe, which is usually made of a fine conducting wire plunged vertically into the electrolyte.

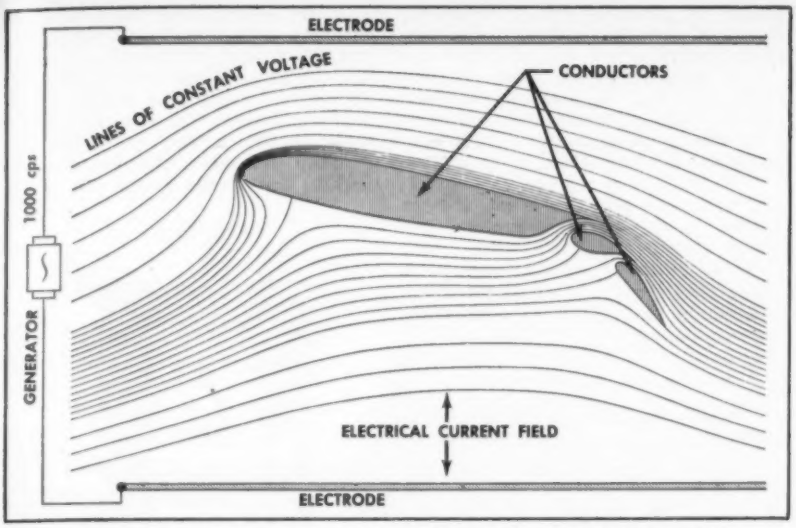
Any problem that can be stated in terms of a potential field can be studied in terms of its tank analog.

A representative French installa-



FLOW AROUND a circular cylinder is being found by a probe exploring the electrical field in a rheoelectric analogy tank, below. Upper right: probe, model and pantograph mechanism. Upper left: scribe traces the flow.





FLOW AROUND an airfoil section with double slotted flap is defined by tank.

tion requires an aerodynamicist to set up the problems. A supervising lead man and about 15 technicians need only rudimentary training. Such an organization can work half a dozen tanks.

When windtunnel data concerning a family of proposed shapes are available, the following techniques may be used:

Those shapes that offer superior aerodynamic properties are selected for further study in the tank, where a detailed analysis of the flow fields is made. Such an analysis often explains the reasons, for the good aerodynamic qualities observed in the windtunnel.

The investigator will probably be able to deduce criteria leading to optimum aerodynamic performance. These criteria may call for new shapes to be considered.

The newly chosen shapes can also be studied quite economically in the tank because it uses only inexpensive models, easily built and modified. For these tank results, it is possible to define the range of optimum set-ups for subsequent wind-tunnel tests, thereby reducing windtunnel test time and cost.

The tank can be used during preliminary design efforts when the performance of proposed configurations are needed. It is valuable for structural design purposes when the calculation of aerodynamic loads, which must be known as well as possible, is undertaken.

Who uses it

Until recently, rheoelectric tanks were almost entirely neglected by domestic engineering concerns. Exceptions were Pratt & Whitney, which is using an installation for engine development work. Boeing Aircraft, which is using a tank to study radar interference problems, and RCA, for electron tube and lens design.

The Air Force Office of Scientific Research helped pioneer U.S. studies by Bending Prof. W. B. Brower, Jr., Rensselaer Polytechnic Institute, to Paris to study methods and theory under Malavard. (AFOSR has tank data and blueprints available. Write Director of Aero. Sciences, AFOSR, 14th and Constitution Aves., Washington 25, D.C.) When Brower returned, he installed several tanks at Rensselaer. He estimates that the method's accuracy is within two percent of results obtained from exact analytical theory.

Harvard and Princeton also have tanks of their own.

As part of a Navy project to study the hydrodynamic flow about torpedoes and other bodies, a tank was constructed and operated at the David Taylor Model Basin. Engineers making the study reported that by using the tank they were able to survey velocity distributions of the potential flow about two-dimensional and three-dimensional bodies of revolution with an accuracy comparable to that obtained by direct measurements in the towing basin or water tunnel.

For the propeller field, an investigator developed an electrolytic method for representing the velocity field induced by the vortex sheets leaving the trailing edges of the blades. Based on this work, he constructed an apparatus called the "propeller calculator." This device solves in a few minutes the practical problem of analyzing the operation of giving propeller in various flight regimes.

How to use it

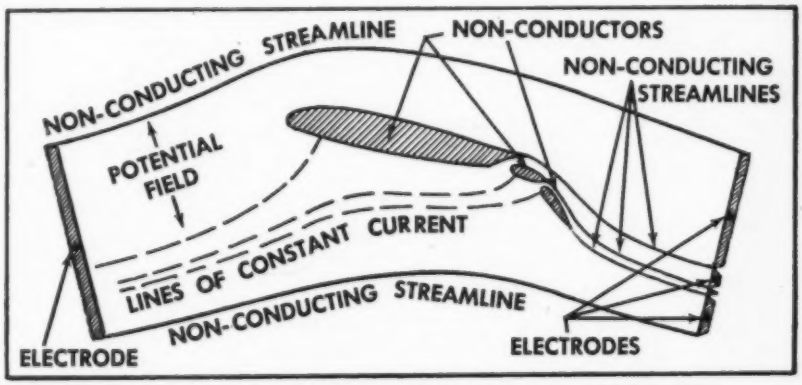
At the present time, tank techniques restrict their use in aerodynamics to incompressible and non-viscous flows. Within these limitations, the aerodynamic art lies in seting up boundary conditions.

A sample problem presented in accompanying figures shows the flow around an airfoil section with a double slotted flap. The characteristics of this section are desired.

A current-conducting model of the section is made and placed in the tank. The model size is determined by the need for keeping small the interference effects of the tank walls.

An electrolyte is let into the tank. The liquid level is the same as that of the model's supper surface, which is seldom over two inches high. An ac voltage is impressed on the bounding electrodes. To avoid polarization and capacitance effects, 1,000 cps current and a weak electrolyte are used.

The electrical potential establishes the flow field. This can be traced through a pantograph mechanism attached to an exploring probe. The analog of the lines of constant voltage are the airflow streamlines.



AIR FLOW can be found by embedding model in a sheet of conducting paper.

Two boundary conditions had been set into this system: the condition of no flow through the bodies, electrically expressed by a constant voltage in the bodies; and the condition of the streamlines leaving the trailing edges of the bodies smoothly. This last boundary condition is easily satisfied by appropriate wiring techniques.

The lift on the airfoil is found in terms of its analog, the current flowing out of the body. The slope of the lift curve is found by varying the angle of attack of the airfoil, followed by an adjustment of the trailing-edge streamlines to conform with the boundary condition of smooth flow.

Because the tank is restricted to

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studies of potential field phenomena, it cannot show the stall characteristics of the airfoil.

A second model is used, this one non-conducting, to find the distribution of local velocities. An easy procedure is to use a sheet of conducting paper to carry the electrical field.

From the first analogy, two bounding streamlines are selected and slit out of the paper. These streamlines are non-conducting. Similarly, the airfoil shape is cut out of the paper, and additional cuts are made along the three streamlines that emerge from the trailing edge of each contour. The boundary conditions of no flow through the body and smooth flow aft of the body are satisfied.

The electrodes are oriented perpendicularly to the analog of the air flow, which are now lines of constant current. Local air velocities are the analog of the voltages found on the surface of the airfoil.

From these local velocities, the engineer can compute the additional aerodynamic characteristics of the airfoil. He can find the local pressure distribution, frictional drag and moment coefficient.

An alter-technique for using the electrolytic tank is called the "lifting line calculator (LLC)." Its aerodynamic value lies in predicting airflow effects on slender wings and bodies.

The flow about such shapes can be found quickly because a thin flat plate is the only model needed. The geometric characteristics are represented by electrical singularities. The LLC is often used to determine the effects of angle of attack, camber thickness, aspect ratio and twist on fiinite wings.

Recently, when Prof. Malavard was in this country, he reported using the tank techniques for finding the aerodynamic characteristics of a wing subjected to blowing at its trailing edge, the jet flap; and for determining the aerodynamic characteristics of annular wings.

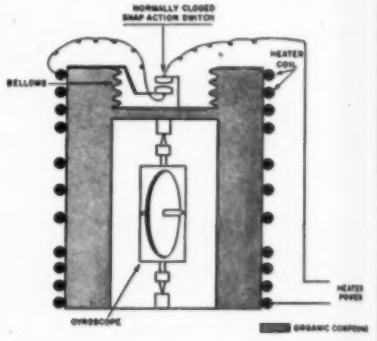
GE's answer to problem of constant-temperature

HOW CAN an instrument manufacturer build a constant-temperature environment into his products, One answer comes from General Electric's Aircraft Products Dept., Schenectady, N.Y.

The secret of the system, which was devised by W. Crocker and H. Lemmerman, is based on the large volume expansion that occurs when some organic compounds change from a liquid to a solid. For example, napthalene has a volume change at its fusion temperature (170°F) of about 14% of its initial volume.

The energy available from this expansion is much higher than that available from a bimetal-operated controller, which would need about 5,000 times as much material as the fusion-temperature device.

The system comprises a container enclosing an instrument, such as a gyro, and an organic compound at its isothermal fusion temperature. When the temperature drops, the compound expands and closes the snap switch that turns on the heaters. When the temperature rises, the compound contracts and the heaters are turned off.



TYPICAL GYRO APPLICATION FOR FUSION-TEMPERATURE CONTROL

By suitable combinations of organic compounds, nearly any temperature environment can be achieved.

Ryan uses fuel tank of T-33 as testbed

Ryan Aeronautical Co. is using a Lockheed T-33 wing-tip fuel tank as an airborne testbed to evaluate guidance systems for supersonic missiles. The test vehicle has a record of many "firings" against a B-47, although it has never left the T-33 wing while in the air.

Purpose of the test program is to wring out the Ryan guidance system under operational environmental conditions. Data is telemetered from the wing tank to a mobile station on the ground where it is observed and stored for later analysis.

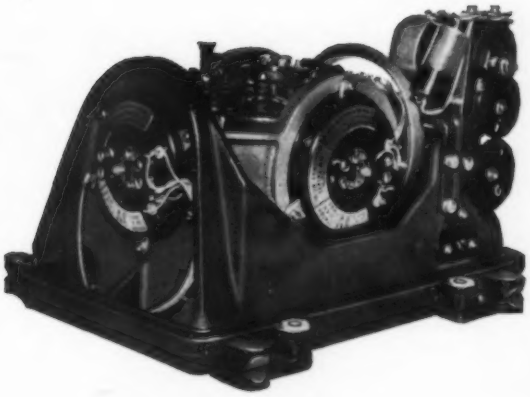
In flight, the guidance system behaves as it would in an airborne missile. Ryan officials feel that it's the closest way to simulate a true tactical air-to-air situation without actually putting the guidance system in a missile.

Installation of the system into the wing tank challenged engineers to come up with a suitable power system to operate the mechanism. The T-33's surplus power was not enough to supply even the moderate needs of the system.

The solution: Ryan engineers built a nitrogen-charged hydraulic system as a self-contained power source.

As seen in photo, there is a blister on the bottom of the tank, which contains a hydraulic reservoir, a telemetering transmitter and electrical guidance package. The ground cart supplies the nitrogen.

The missile guidance system being evaluated was developed by Ryan under Air Force contract. Using continuous wave radar techniques, the systems allow split-second decisions in hypersonic missiles.



Here is Honeywell Aero's new GG53A—the world's first cageable vertical gyro available with either synchros or resolvers that retain test-stand accuracy. An exclusive mounting preserves their accuracy after attachment to the gyro. Highly accurate—within 0.15° or better of true vertical—the GG53A is designed for vertical reference in flight control and radar stabilization, or for any system requiring angular position reference.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL

Circle No. 93 on Reader Service Card.

Cytac: Air Force's new position-fixing system

by Henry P. Steier

A NEW LOW-FREQUENCY SYSTEM of position-fixing called Cytac was revealed by the Sperry Gyroscope Co. at the IRE meetings in New York. It was developed by Sperry's navigation system department for the Air Force.

Cytac belongs to the class of position-fixing systems which give information by measurements made on time of pulsed-signal arrival from cooperating transmitters. They are generally called hyperbolic systems.

According to Sperry engineers W. N. Dean, R. L. Frank and W. P. Frantz, the new system achieves greater range, accuracy and reliability over land and sea at all altitudes than other hyperbolic systems.

Cytac uses ground-wave cycle-phase-measuring to establish position. It operates with a 100-kc carrier frequency. The Loran system now in use for coastal and overseas navigation operates at 2 mc.

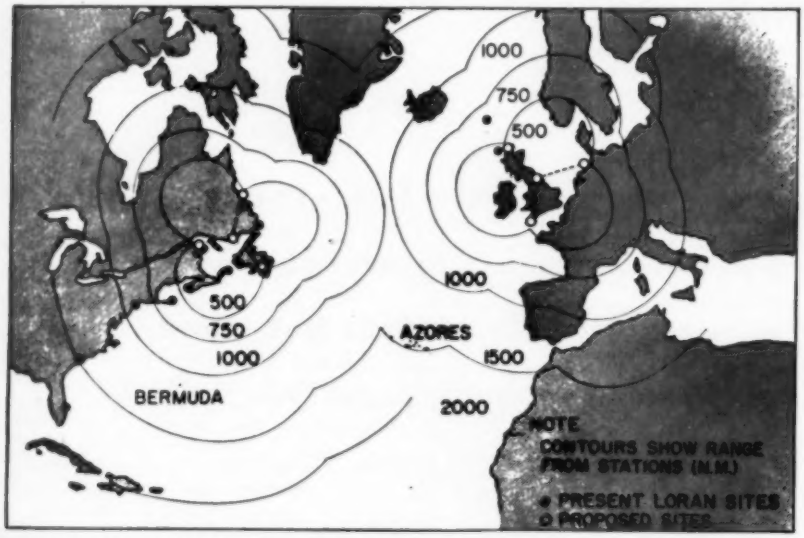
Sperry engineers said accuracy of Cytac is believed to approach the optimum that can be achieved by radio means. Position-fixing is done by measuring the relative time of arrival of the leading phases of rf signals from each of three stations—a master and two slaves.

Accuracy of position-fixing in such systems as Loran and Cytac depends upon synchronization of the transmitting stations, matching and identifying sky and ground wave components of the signal, reading instrument accuracy. Weather effects are also important.

An important benefit in Cytac is the frequency used. There is theoretically no limit to its range as with line-of-sight systems or in medium frequency systems where the sky wave must be used for over 1,200 mile ranges. Range limit is determined solely by power with Cytac.

Cytac may be employed as a transcontinental system covering the U.S., for transoceanic use across the North Atlantic and for marine navigation.

With Loran complete coverage of the North Atlantic area exists only at night. With Cytac coverage would be given day and night during all seasons. Accuracy in remote Atlantic areas would be 10-15 miles.



TWO CYTAC STATIONS located in Canada and Great Britain would provide long-range navigation aid to trans-Atlantic flights in daylight and darkness and during all seasons.

Experimental system in operation

An experimental system of three Cytac stations has been operating in the Eastern U.S. during the past year. Based upon the belief that overall variation in synchronization of signals from Cytac transmitters can be kept to within 1/10 microsecond, Bureau of Standards monitoring stations have been collecting data on position-fixing accuracy in various inland areas of the U.S.

Signals from a master station at Caroline Beach, N.C. and two slaves of 200-kw power at Forresport, N.Y. and 50 kw at Carrabelle, Fla. showed high "fix" accuracies. "Fix" accuracies using ground wave signals only were recorded as 100 feet in areas within about 100 miles of the stations to 828 feet in Kansas.

The engineers suggested that if a four-station layout were used 15 stations could cover the U.S. and give accuracy that would be within 100 feet for most locations.

On the trans-Atlantic route a four-station system in Canada and one in England would give a fix accuracy of 2,000 feet all the way across the North Atlantic.

Sperry's designers said a 40-50 pound airborne unit that presents navigation data on counter type dials could be built. A pictorial display unit to convert to polar or rectangular coordinates could be added and would weigh about 20 pounds, they said.

Signal strength from Cytac stations is strong. The airborne antenna would be only about 12 inches long or less.

Sperry has a contract with the Navy and Coast Guard to install a three-station system for operation during the next year and a half.

Vernon Weihe, a member of Air Transport Association's technical staff, told the IRE he believes what may be needed for en route traffic control is a broad base line system such as Cytac or the French Web system (AMERICAN AVIATION, May 7, 1956).

This idea was previously suggested by Anast, who said latest studies show we are reaching the point of diminishing returns with point-source systems such as VOR and Tacan in cost, complexity and best use of the radio spectrum.

Weihe said that in regard to our 10-mile wide airline corridors established for lateral separation the industry is deluding itself. Despite the rated precision of our navaids this corridor width is not maintained in operation.

A multiplicity of point sources for navigation information are provided by VOR or Tacan stations to which a pilot can tune during a flight. During an en route flight the pilot tunes to the one he wishes to use. The farther he goes from one the less accurate the reference becomes. Different pilots on different airlanes going in the same direction might be using different stations with a resulting error between references.

With more and faster civil and military aircraft getting into the air, greater accuracy is needed to maintain separation even by present regulations. This would be aided by a common reference system such as a Cytac, Web or another broad-base system would give, Weihe thinks.

APRIL 8, 1957

AMERICAN AVIATION

Engineering Employment Survey

"WANTED: A competent engineer. Reward: $550." This is the way one company advertised for engineers at a recent Institute of Radio Engineers show. This unusual ad also reflected industry's desperate plight in its search for technically-trained personnel.

Equally as serious as the plight of industry is the need of newly graduating and experienced engineers to know where they can best use their special talents.

To help these men, the editors of AMERICAN AVIATION made an extensive employment survey of leading aviation companies. Among the questions asked were: What jobs are open? What type engineers are preferred? How much experience should they have?

Industry response was overwhelming. One company with a current need for over 20,000 engineers sent in its salary scale. It showed that experienced men could expect between $6,000 and $15,000 per year, depending on the engineering speciality. Men with engineering degrees and only three years' experience could expect $6,500 or more per year. Executive engineers would start in the five-figure bracket.

The tremendous expansion in the aircraft industry was vividly illustrated by another correspondent who wrote that his company now employs 650 degree-bearing engineers, and would like to boost that number to 900 by next year, an increase of nearly 50%.

New engineering graduates and experienced engineers who are not working to their full technical capacity on engineering projects connected with national defense are urged to consider the employment opportunities listed on the following pages.

As a free service for these engineers, the editors have prepared an industry-approved short-form application blank, called AVFORM, which can be obtained simply by circling No. 200 on Reader Service Card and dropping it in the mail; or by writing AVFORM, American Aviation, 17 East 48th St., New York 17, N. Y. Please state how many AVFORMS are needed.

Where are the challenging jobs in aviation engineering today? What education and experience are needed to get them? Based entirely on company-furnished data, AMERICAN AVIATION's engineering employment survey answers these and other questions. As a further service to industry and its technicians, reprints of this survey are being posted on the bulletin boards of more than 200 engineering colleges throughout the country.

Key to engineering opportunities in aviation

To give applicants as much information as possible about engineering positions currently available, the main listing is divided into five categories. These correspond to the college degree that employers prefer applicants hold —aeronautical engineering, chemical engineering, civil engineering, electrical engineering, and mathematics or physics.

Listed under each category are the names of the companies seeking engineers and the type of engineers needed. This last information is given symbolically and is keyed to the table headed "Symbols for Job Descriptions."

For example, the symbol *1b* denotes a fixed-wing aerodynamicist having 3-5 years' experience in the field. The symbol *48ab* denotes on air-conditioning engineer having 0-5 years' experience in the field.

The number of jobs available is denoted by the parenthetical number following the job-description symbol.

Final listing gives company addresses and names of interested officials.

Symbols for JOB DESCRIPTION

a = 0-3 years experience
b = 3-5 years experience
c = 5-10 years experience
d = over 10 years experience
exp. = experienced

AERODYNAMICS
- Fixed Wing 1
- Rockets/Missiles 2
- VTOL and STOL 3

AIRFRAME DESIGN
- Surfaces/Bodies 4

ARMAMENT
- Fire control Sys. 5
- Rocket Launchers 6
- Rockets/explosive 7

DETAIL DESIGN
- Drafting/Computations 8

DYNAMICS
- Field/wind tunnel testing 9
- Load/vibration analyses 10

ELECTRICAL
- Electrical power systems 11

ELECTRONICS
- Antennas 12
- Circuitry 13
- Components 14
- Computers 15
- Infrared 16
- Magnetic Amplifiers 17
- Pulse 18
- Radar 19
- Radomes 20
- Receivers 21
- Sonar 22
- Test/Serv. 23
- Transistors 24

GUIDANCE
- Computer Sys. 25
- Guidance Sys. 26
- Instrumentation 27
- Servomechanisms 28
- Telemetering 29

HYDRODYNAMICS
- Hydrodynamic Analysis 30

INSTRUMENTATION
- Autopilots 31
- Computer Sys. 32
- Electromechanics 33
- Flight Test 34
- Gages/Indicators 35
- Gyros 36
- Navigation 37
- Packaging/Installation 38
- Programming 39
- Servomechanisms 40
- Systems Engineering 41
- Test/Service 42

LIAISON
- Customer Contact 43
- Mfg./Eng. 44
- Metallurgy 45
- Production 46
- Tooling 47

MECHANICAL
- Air Conditioning 48
- Auxiliary power equip 49
- Control Systems 50
- Landing Gears 51
- Design Layouts 52
- Hydraulic Sys. 53
- Launching Equip. 54
- Mechanisms 55
- Pneumatic Sys. 56
- Turbine/compressor design 57
- Oper. Research 58

PHYSICS AND MATHEMATICS
- Acoustics 59
- Anti-gravity 60
- Solid State Studies 61

NUCLEAR
- Controls Anal. 62
- Element Prob. 63
- Heat Transfer 64
- Instrumentation 65
- Metallurgical Corrosion 66
- Fuel 67
- Nuclear Analyses 68

PROJECT MANAGEMENT
- Aircraft 69
- Electronics 70
- Missiles 71

PROPULSION
- Aero-thermodynamics 72
- Auxiliary power Sys. 73
- Fuels/oxidants 74
- Heat Transfer 75
- Powerplants/Boosters 76

STRUCTURES
- Aeroelasticity/flutter 77
- Static/dynamic test 78
- Structural Anal. 79

TECHNICAL WRITING
- Writing/editing 80

WEIGHTS
- Weight/Balance studies 81

Aeronautical Engineering Degree Preferred

AEROTHERM CORP.
8a(1), 78a(1), 79a(1)

ALLIED RESEARCH ASSOCIATION
1abc(4), 2abc(4), 4ab(1), 10abc(4), 27ab(2), 28abc(2), 30abc(4), 33abc(2), 40abc(2), 41abc(2), 72abc(4), 75abc(4), 77abc(4), 79abc(4)

AMERICAN MOTORS CORP.
Special Products Division
4b(4), 8b(5), 10b(13), 15b(2), 48b(3), 52b(3), 72b(3)

AVCO
Crosley Division
1c(2), 2c(2), 9c(5), 10c(2), 52ab(10), 70c(2), 71c(2), 77bc(2), 79bc(2), 81ab (2)

BEECH AIRCRAFT CORP.
1ab(3), 2b(1), 4bc(2), 6b(2), 8a(25), 10bc(3), 11a(10), 34bc(1), 43a(5), 44a(10), 49a(5), 50ab(3), 51ab(1), 52a(50), 53a(2), 54ab(1), 55ab(5), 72bc(2), 76ab(1), 77abc(1), 79abc(2), 80a(2), 81ab(3)

BELL AIRCRAFT CORP.
1d(20), 2a(15), 3b(5), 9b(8), 77c(3)

BENDIX AVIATION CORP.
Bendix Products Division—Missiles
4a(1), 9b(2), 72a(1), 81b(1)

CENTURY ENGINEERS, INC.
6b(2), 13b(3)

CHANCE VOUGHT AIRCRAFT, INC.
Numerous openings in all areas of engineering responsibility for engineers with all types of degrees applicable to aircraft industry. Also several openings for Math and Physics degrees.

CHRYSLER CORP.
64bcd(1)

CONTINENTAL AVIATION AND ENGINEERING
10a(1), 57b(3), 72b(1)

CONTROL SPECIALISTS
26b, 50b

DENVER RESEARCH INSTITUTE
1b(1)

DOUGLAS AIRCRAFT CO., INC.
Need engineers, physicists and mathematicians for all 5 Douglas Divisions. Requirements cover all categories.

FAIRCHILD ENGINE & AIRPLANE CORP.
Fairchild Aircraft Division
1b(6), 3c(5), 4c(15) or MEc(15) acceptable, 8a(10) CEa(10), MEa(10) or EEa(10) acceptable, 34c(14) MEc(14) or EEc(14) acceptable, 38c(2), MEc(2), EEc(2) acceptable, 40c(7), MEc(7) or EEc(7) acceptable, 41c(4), MEc(4), EEc(4) or M/Pc(4) acceptable, 50c(2) or MEc(2) acceptable, 51c(3) or MEc(3) acceptable, 52c(6) or MEc(6) acceptable, 53c(4) or MEc(4) acceptable, 55c(7) or MEc(7) acceptable, 56c(3) or MEc(3) acceptable, 58c(6), MEc(6) or EEc(6) acceptable, 64c(2) or MEc(2) acceptable, 65c(4),

MEc(4) or EEc(4) acceptable, 67c(3), MEc(3) or EEc(3) acceptable, 68c(3) MEc(3) or EEc(3) acceptable, 72c(5) or MEc(5) acceptable, 73c(5) or MEc(5) acceptable, 75c(4) or MEc(4) acceptable, 76c(1) or MEc(1) acceptable, 77c(5) MEc(5) or M/Pc(5) acceptable, 78c(2) MEc(2) or M/Pc(2) acceptable, 79c(6), MEc(6) or M/Pc(6) acceptable, 80b(2), MEb(2) or EEb(2) acceptable, 81a(2) MEa(2) or EEa(2) acceptable

Fairchild Guided Missile Division
2bc, 8ab, 9bc, 10bc

FEDERAL TELECOMMUNICATIONS LABORATORIES
2c(1), 4c(1)

FLUIDYNE ENGINEERING CORP.
1b(1)c(1), 9b(2)d(1), 72b(1)d(1), 43b(1)

GENERAL MOTORS CORP.
Allison Division
2, 41, 42, 57, 72

GYRODYNE CO. OF AMERICA
3b(1), 4b(1), 34b(1), 79b(1)

HARDMAN TOOL & ENGINEERING
52b(1)

HARTZELL PROPELLER, INC.
49(1)

HAYES AIRCRAFT CORP.
1c(2), 2c(1), 4c(2), 10c(2), 45c(2), 52b(2), 72c(1), 76b(2), 77c(1), 79b(1)

HILLER HELICOPTERS
1a(1), 3b(4)c(2), 8a(2), 34b(2), 58c(2), 77b(1), 79c(3), 81c(1)

HUNTER-BRISTOL CORP.
8b(3), 77b(1), 78b(2), 81b(1)

LOCKHEED AIRCRAFT CORP.
California Division
1abcd, 3c, 4abcd, 8a, 9abcd, 10abcd, 28cd, 31bc, 32bc, 34abcd, 37cd, 39abcd, 40cd, 58cd, 72abcd, 75abcd, 76cd, 77abcd, 78abcd, 79abcd, 80ab, 81abcd

THE MARTIN CO.
1a(16), 2b(12), 4a(9), 8a(8), 9b(6), 10b(8), 30b(6), 34b(1), 43a(2), 44a(2), 46a(4), 58d(1), 59b(2), 69d(3), 70d(1), 71d(1), 77a(12), 78a(4), 79b(10), 80a(4), 81a(2)

MENASCO MANUFACTURING CO.
51b(2), 52b(4), 53b(2)

NORTHROP AIRCRAFT, INC.
4b(4), 1cd(2), 34ac(5), 42a(3), 50a(5), 52a(5), 54a(3), 57a(5), 58a(3), 74b(3), 75bc(4), 76c(3), 77ac(2), 78a(1), 79a(3), 81a(3)

OPERATORS RESEARCH
58b

RADIO CORP. OF AMERICA
43

RAYTHEON MFG. CO.
2b(3)

ROHR AIRCRAFT CORP.
4abcd(50), 52abc(20), 56abc(5), 79abc(5)

RYAN AERONAUTICAL CO.
1a, 3a, 10b, 39b, 58b, 77a, 81c

How many scientists and engineers work in aviation?

As an indication of the percentages of engineers and scientists in relation to total employment in larger companies, here are the figures for 16 firms with 6,000 or more employees.

Company and Division	Total Employment	Engineering & Scientific Personnel	% Engineering & Scientific Total Emplmt.
Douglas Aircraft	82,000	8,000	10
Lockheed-Calif Div.	33,000	3,000	9
The Martin Co.	26,685	3,140	12
Raytheon Mfg.	22,000	2,100	10
General Motors-Allison Div.	19,000	1,300	7
Bell Aircraft	16,000	990	6
Chance Vought	14,289	1,500	10
Temco Aircraft	10,730	812	8
United-Sikorsky Div.	10,000	450	5
Fairchild-Aircraft Div.	9,000	597	7
Hayes Aircraft	8,091	170	2
AVCO-Crosley Div.	8,000	725	9
Rome Air Development Center	7,410	346	5
Rohr Aircraft	7,345	270	4
Beech Aircraft	7,125	450	6
Solar Aircraft	6,200	300	5
Bendix-Radio Division	6,000	450	8

SOLAR AIRCRAFT CO.
2cd(2), 4abc(3), 8ab(12), 23c(1)

STROUKOFF AIRCRAFT CO.
1b(2), 10b(1), 34a(1), 48b(1), 50b(2), 52c(6), 53c(1), 55c(1), 76c(1), 79a(2)b(2), 80b(1)

SUMMERS GYROSCOPE CO.
50(10), 52(10), 55(10), 65(10)

SURFACE COMBUSTION CORP.
Janitrol Aircraft-Automotive Div.
48bc(2), 50bc(1), 55bc(1), 56bc(1), 75bc(1)

TEMCO AIRCRAFT CORP.
1abcd(5), 2abcd(6), 4abcd(10), 6ab(10), 9abc(3), 10abc(3), 44abc(4), 45abc(2), 46ab(3), 50ab(4), 51ab(4), 52ab(2), 53ab(2), 54ab(5), 55ab(5), 56ab(3), 58b(2), 69c(1), 70c(2), 71c(2), 72b(3), 75abc(4), 77c(5), 79c(2), 81b(2)

UNITED AIRCRAFT CORP.
Sikorsky Division
3exp(3), 4b(4), 8exp(4), 10b(4), 31exp(2), 78b(3), 79b(5), 81b(5)

VERTOL AIRCRAFT, INC.
3ac(3), 4ac(2), 9ac(2), 10ac(2), 34a(4), 51ac(1), 72d(1) or MEd(1) or M/Pd(1) acceptable, 76d(1), 77ac(3), 78ac(3), 79ac(3)

E. B. WIGGINS OIL TOOL CO.
8b(1)

Civil Engineering Degree Preferred

BEECH AIRCRAFT CORP.
79abc(2), 81ab(3)

BENDIX AVIATION CORP.
Bendix Products Division-Missiles
69b(1)

CHANCE VOUGHT AIRCRAFT, INC.
Numerous openings in all areas of engineering responsibility for engineers with all types of degrees applicable to aircraft industry. Also several openings for math and physics degrees

CHRYSLER CORP.
64bcd(1), 78bcd(1)

DOUGLAS AIRCRAFT CO., INC.
Need engineers, physicists and mathematicians for all 5 Douglas Divisions. Requirements cover all categories.

DRESSER-IDECO CO.
8abcd(8), 43ab(2), 79abcd(4)

FAIRCHILD ENGINE & AIRPLANE CORP.
Fairchild Aircraft Division
8a(10), AEa(10), MEa(10) or EEa(10) acceptable, 44c(5) or MEc(5) acceptable.

GYRODYNE CO. OF AMERICA
4b(1), 79b(1)

HILLER HELICOPTERS
4a(1), 79b(4)

LOCKHEED AIRCRAFT CORP.
California Division
4abcd, 52abcd, 77abcd, 78abcd, 79abcd

THE MARTIN CO.
4b(11), 8a(7), 43b(4), 47b(2), 77b(15), 78b(7), 79b(10), 80b(2), 81b(5)

MENASCO MANUFACTURING CO.
51a(4), 79b(3)

NORTHROP AIRCRAFT, INC.
4a(1), 42a(2), 52a(2), 79a(3)

RALPH M. PARSONS CO.
79b(1), 80b(1)

RADIO CORP. OF AMERICA
11

ROHR AIRCRAFT CORP.
79abc(15)

TEMCO AIRCRAFT CORP.
4ab(3), 44ab(2), 50ab(4), 51ab(4), 52ab(1), 78b(2), 79b(2), 81c(1)

UNITED AIRCRAFT CORP.
Sikorsky Division
8exp, 78a(3)

VERTOL AIRCRAFT, INC.
3ac(2), 4ac(3), 9ac(1), 10ac(2), 51-ac(2), 52a(5), 53a(1), 77ac(2), 78a(2), 79ac(3), 80a(1), 81a(1)

Chemical Engineering Degree Preferred

ACUSHNET PROCESS CO.
Rubber Division
43c(1), 44a(1)

AMERICAN BOSCH ARMA CORP.
Arma Division
2a(4)

BEECH AIRCRAFT CORP.
45a(2), 74ab(5)

CHANCE VOUGHT AIRCRAFT, INC.
Numerous openings in all areas of engineering responsibility for engineers with all types of degrees applicable to aircraft industry. Also several openings for math or physics degrees.

CHRYSLER CORP.
63bcd(1), 64bcd(1), 66b(2)

DENVER RESEARCH INSTITUTE
7b(1)

DOUGLAS AIRCRAFT CORP.
Need engineers, physicists and mathematicians for all 5 Douglas Divisions. Requirements cover all categories.

GENERAL ELECTRIC CORP.
Aircraft Gas Turbine Division
1957*—42ad(64), 46ab(3), 57ad(10), 72ab(15) 76ab(2)
1958*—42ad(76), 46ab(3), 57ad(11), 72ab(16), 76ab(2)

Atomic Products Division
1957*—67ad(15), 68ad(613)
1958*—67ad(16), 68ad(612)

Components Products Division
1957*—11ab(5)
1958*—11ab(6)

Defense Electronics Division
1957*—14abcd(41)
1958*—14abcd(54)

Electronic Components Division
1957*—15abcd(20), 24abcd(17)
1958*—15abcd(34), 24abcd(27)

Industrial Electronics Division
1957*—14abcd(15)
1958*—14abcd(9)
*estimated vacancies for year

GENERAL MOTORS CORP.
Allison Division
74

LOCKHEED AIRCRAFT CORP.
California Division
74abcd

THE MARTIN CO.
63b(6), 66b(10), 67b(3), 68c(11), 74c(3)

Significant military electronics projects at Hoffman have created a wide variety of stimulating assignments for engineers possessing these qualifications:
MECHANICAL ENGINEERS
Experience in electromechanics and a sound knowledge of intricate mechanisms. Electronics experience is desirable.
ELECTRONICS SYSTEMS ENGINEERS
Background in fields related to VHF, UHF, microwave transmission and reception, ECM, forward scatter, single sideband, radar and navigation.
Engineers having experience and competence in these areas are invited to write Chief Engineer.
Hoffman LABORATORIES, INC.
A SUBSIDIARY OF HOFFMAN ELECTRONICS CORP.
3761 South Hill Street, Los Angeles 7, Calif.
Circle No. 120 on Reader Service Card.

OLIN MATHIESON CHEMICAL CORP.
74ab(25)

OPERATIONS RESEARCH
58b

RAYTHEON AIRCRAFT CORP.
20b(2)

ROHR AIRCRAFT CORP.
45ab(5)

SOLAR AIRCRAFT CORP.
7c(1)

SURFACE COMBUSTION CORP.
Janitrol Aircraft-Automotive Div.
48bc(2), 75bc(1)

VERTOL AIRCRAFT CORP.
80a(2)

Mechanical Engineering Degree Preferred

ACUSHNET PROCESS CO.
Rubber Division
43c(1), 44a(1)

AEROTHERM CORP.
8a, 78a(1), 79a(1)

AIRPAX PRODUCTS
13ab(2), 14ab(2), 17ab(2), 33ab(2), 40ab(2)

ALLIED ORDNANCE CORP.
53a(1), 56a(1)

ALLIED RESEARCH ASSOCIATION
1abc(4), 2abc(4), 4ab(1), 5ab(1), 10abc(4), 25abc(2), 26abc(2), 27ab-(2), 28abc(2), 30abc(4), 33abc(2), 36abc(2), 40abc(2), 41abc(2), 50abc-(4), 55abc(2), 62abc(2), 64abc(2), 65abc(2), 72abc(4), 75abc(4), 77abc-(4), 79abc(4)

AMERICAN BOSCH ARMA CORP.
Arma Division
2abc(10), 5abcd(5), 11abc(2), 15-abcd(10), 26abcd(10), 27abcd(10), 36abcd(10), 38abcd(2), 41abcd(5), 45abcd(1)

AMERICAN ELECTRONICS, INC.
8a, 11a, 33ab, 43ab, 65ab, 70ab, 80a

AMERICAN MACHINE & FOUNDRY CO.
Alexandria Division
8b(4), 14c(1), 44c(2), 52b(3), 80b(2)

AMERICAN MOTORS CORP.
Special Products Division
4b(4), 8b(5), 52b(3)

APPLIED SCIENCE CORP. OF PRINCETON
33bc(2)

ATKOMATIC VALVE CO.
53c(1)

AVCO
Crosley Division
1b(10), 2c(5), 4b(10), 10b(10), 19-b(5), 36abc(5), 40abc(5), 54bc(2), 55abc(3), 70c(2), 71c(2), 79bc(2), 81ab(2)

(Continued on Page 58)

Antenna wave propagation studies for new designs are made from models like this.

The sky is not the limit for engineers

Advanced programs of research and development are continually going on at North American's Columbus Division—programs that stimulate the imagination. Microwave, radome, antenna, flight control, fire control, servo-mechanisms and many more such projects are under intensive study. The men engaged are opening up entirely new areas in their professional fields.

This is a particularly favorable time for *you* to join this rapidly growing Engineering Department. Facilities include 16 completely equipped laboratories. A new air-conditioned engineering building will soon be completed.

The Columbus Division has prime responsibility for all North American's aircraft projects for the Navy—from concept through flight. Fine career opportunities for good men are available now. You should investigate immediately.

OPPORTUNITIES IN EVERY FIELD:

Aerodynamicists, Thermodynamicists, Dynamicists, Stress Engineers, Structural Test Engineers, Flight Test Engineers, Mechanical and Structural Designers, Electrical and Electronic Engineers, Wind Tunnel Model Designers and Builders, Power Plant Engineers, Research and Development Engineers, Weight Engineers.

Now is the time to act. Write: Mr. J. H. Papin, Personnel Manager, Dept. 56 2-A North American's Columbus Division, Columbus 16, Ohio.

THE COLUMBUS DIVISION OF

NORTH AMERICAN AVIATION, INC.

Mechanical Engineering Degree Preferred

BEECH AIRCRAFT CORP.
4bc(2), 6b(2), 8a(20), 11bc(3), 38bc-(1), 43a(5), 48bc(1), 49a(5), 50-ab(3), 51ab(1), 52a(25), 53a(2), 54-ab(1), 55ab(5), 72bc(2), 75ab(2), 76ab(1), 77abc(2), 79abc(3), 80a(2), 81ab(3)

BELL AIRCRAFT CORP.
2a(15), 3b(5), 8b(5), 9b(10), 10b(5), 30b(2), 58b(2), 59c(2), 77b(5), 78b-(3), 79b(3), 81ab(5)

BENDIX AVIATION CORP.
Pioneer Central Division
13b(4), 17a(2), 24a(1), 28a(2), 33-a(2), 56a(1), 80b(2)
Bendix Products Division—Missiles
1a(1), 2a(1), 4b(1), 8a(1), 9b(2), 10b(1), 14b(2), 18a(1), 23b(1), 27-a(1), 28b(1), 29b(1), 30a(1), 33b(3), 36a(1), 38b(1), 41b(1), 43b(1), 44-b(1), 46b(7), 47b(2), 49b(1), 51a(1), 52a(1), 53b(3), 58b(1), 70b(1), 71-b(5), 72a(1), 75a(1), 76a(1), 77b(2), 79b(3), 80b(1)
Bendix Radio Division
12abcd, 19abcd, 21abcd, 26abcd, 28-abcd

BREEZE CORP.
8c(4), 49b(3)

BROADVIEW RESEARCH & DEVELOPMENT
75b(1)

CEDAR ENGINEERING, INC.
31b(1), 33b(1), 36ab(1)

CHANCE VOUGHT AIRCRAFT, INC.
Numerous openings in all areas of engineering responsibility for engineers with all types of degrees applicable to aircraft industry. Also several openings for math or physics degrees.

CHRYSLER CORP.
9bcd(1), 10bcd(2), 55bcd(2), 57bcd-(2), 63bcd(1), 64bcd(1), 78bcd(1)

CONTINENTAL AVIATION & ENGINEERING CORP.
10a(1), 50b(2), 57b(4), 72b(3), 79b-(2), 81b(2)

CONTROL SPECIALISTS, INC.
8a, 50b, 52a, 53b

COOK ELECTRIC CO.
40d(1), 50b(1)

DENVER RESEARCH INSTITUTE
7b(1), 36b(1), 40b(1)

DESIGNERS FOR INDUSTRY, INC.
17b(1), 33c(1), 41c(1), 50b(2), 53b(1)

DOUGLAS AIRCRAFT CO., INC.
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4bc, 8ab, 9bc, 10bc, 27bc, 28bc, 34ab, 38bc, 40bc, 49bc, 80bc

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1957*—67ab(2), 68ad(593)
1958*—67ad(16), 68ad(606)
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1957*—11ab(55)
1958*—11ab(63)
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1958*—14abcd(609)
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1957*—15ab(16), 24ab(16)
1958*—15ab(21), 24ab(20)
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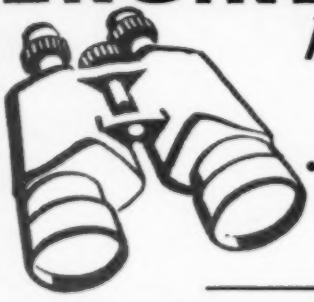

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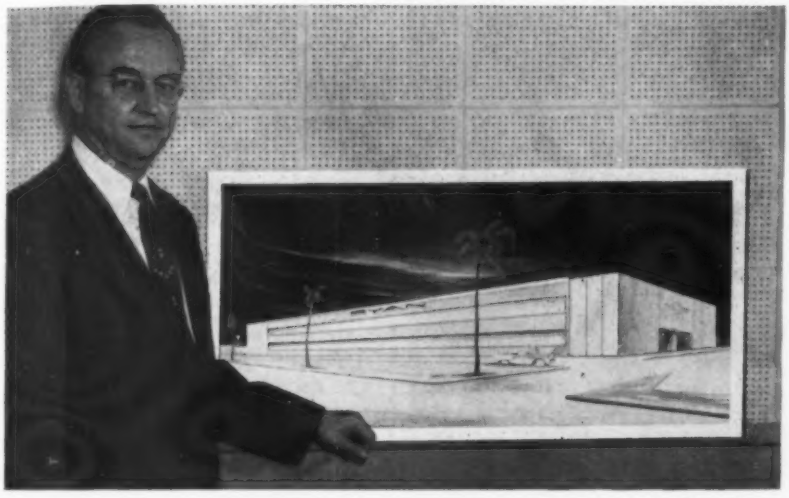

FRANK W. FINK, RYAN VICE PRESIDENT AND CHIEF ENGINEER inspects architect's drawing of new Engineering and Research Center.

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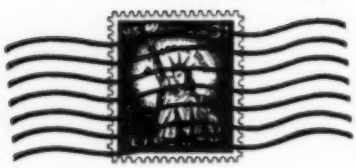
Guided Missile Division
8ab, 10bc, 12bc, 13bc, 18bc, 19bc, 21bc, 25bc, 26bc, 27bc, 28bc, 31bc, 32bc, 33bc, 34ab, 38bc, 39bc, 40bc, 41bc, 80bc



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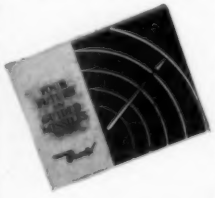

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FLUIDYNE ENGINEERING CORP.
40c(1), 50b(1)

GENERAL ELECTRIC CORP.
Aircraft Gas Turbine Division
1957*—42ad(126), 46ab(12), 57ab-(17), 72ab(65), 76ab(2)
(1958 Projected Vacancies)
1958*—42ab(149), 46ab(16), 57ab-(19), 72ab(63), 76ab(2)

Atomic Products Division
1957*—67ab(5), 68ad(228)
1958*—67ab(7), 68ad(287)

Components Products Division
1957*—11ab(142)
1958*—11ab(158)

Defense Electronics Division
1957*—14abcd(1279)
1958*—14abcd(1754)

Electronic Components Division
1957*—15abcd(157), 24ab(35)
1958*—15abcd(176), 24ab(45)

Industrial Electronics Division
1957*—14abcd(174), 15abcd(73)
1958*—14abcd(221), 15abcd(95)
*Estimated vacancies for year

GENERAL MILLS
Mechanical Division
5b(1), 8b(3), 12c(1), 13c(1), 14c(1), 15c(2), 16c(2), b(3), 18c(1), 19c(1), 25c(1), 26c(2), 28c(1), 32c(12), 33c-(10), 36c(1), 37c(3), 38c(1), 41c(1), 70bc(5), 80b(1)

GENERAL MOTORS CORP.
Allison Division
11, 14, 15, 17, 23, 33, 40, 41

GYRODYNE CO. OF AMERICA
34b(1)

HAYES AIRCRAFT CORP.
11c(2), 13b(2), 16c(2), 52b(2)

HETHERINGTON, INC.
14a(5)

HILLER HELICOPTERS
11b(1)c(1), 26c(1)

HUNTER-BRISTOL CORP.
11b(1), 14b(1)

INDIANA STEEL PRODUCTS CO.
14a(2)

INSTRUMENTS FOR INDUSTRY, INC.
13b(8)

KEARFOTT CO., INC.
13bc(2), 15b(1), 17b(1), 23b(2), 24ab(2), 25b(1), 26c(1), 28bc(2), 32ab(1), 33b(1), 40b(1), 41c(1), 70c(1), 71c(1)

THE LIQUIDOMETER CORP.
13c(1), 24b(1)

LOCKHEED AIRCRAFT CORP.
California Division
11cd, 12abcd, 13abcd, 14abcd, 15abcd, 16cd, 17cd, 18abcd, 19abcd, 20cd, 21abcd, 22abcd, 24abcd, 26cd, 27abcd, 28cd, 29abcd, 31cd, 32cd, 34abcd, 37cd, 39abcd, 40cd, 41cd, 52abcd, 58cd, 59cd, 80ab

MAGNETIC RESEARCH CORP.
14b(2), 17b(6), 18b(2), 23a(2), 24b(6), 27b(2), 26b(4), 29b(2), 35b(2), 40b(2), 42a(2), 43a(2), 70c(1)

MANNING, MAXWELL & MOORE, INC.
15b(1), 17c(1), 50d(1)

THE MARTIN CO.
4b(9), 8a(7), 11b(11), 12a(10), 13b(9), 14b(6), 15b(5), 16b(4), 17b(6), 18b(5), 19b(1), 20b(2), 21b(1), 22b(2), 23b(18), 24c(3), 25a(3), 26c(4), 27b(6), 28a(3), 29b(7), 31b(6), 32b(2), 34b(1), 35b(1), 36b(2), 38b(2), 40a(7), 42a(5), 43a(4), 44a(2), 46a(4), 47b(8), 48b(4), 49b(2), 50b(1), 58c(2), 62b(3), 63a(4), 64b(7), 65a(8), 70d(1), 71d(1), 75b(3), 80a(2)

MICA INSULATOR CO.
11b(1)

MICROLAB
12a(1), 14a(1), 19a(1)

MOOG VALVE COMPANY, INC.
13b(1)

MORSE INSTRUMENT CO.
8ab, 13c, 80ab

NORTH AMERICAN PHILIPS CO.
Philips Laboratories Div.
14b(5), 61b(1)

NYT ELECTRONICS, INC.
14a(2), 17a(1)

THE NARDA CORP.
19b(2)

NATIONAL SCIENTIFIC LABORATORIES, INC.
12ab(3), 13a(2), 14a(2), 18a(1), 19b(5), 21b(4), 26b(1), 37c(1), 41c(1), 70c(2)

NORTHROP AIRCRAFT, INC.
11c(5), 12bc(2), 13ab(4), 16c(1), 19d-(3), 20b(1), 21b(3), 23a(3), 24a(6), 25ab-(6), 26ab(6), 27a(6), 28ac(8), 29ac(6), 31ac(3), 32ac(6), 33ac(4), 35b(1), 36bc-(2), 37ac(4), 38bcd(4), 39ab(3), 40ac(4), 41cd(2), 42a(5), 50a(2), 58a(3), 59c(1)

OLIN MATHIESON CHEMICAL CORP.
13b(1)

OPERATIONS RESEARCH
58b

PAN AMERICAN WORLD AIRWAYS, INC.
11a(1)

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RAYTHEON MANUFACTURING CO.
12b(10), 13b(28), 14c(20), 17b(6), 18c-(8), 19b(30), 21a(10), 22a(2), 23b(10), 24c(3), 26c(5), 27b(4), 28a(6), 29c(2), 31c(3), 37a(4), 40b(4), 41c(6), 80a(5)

ROBERTSHAW-FULTON CONTROLS CO.
12bc(2), 13bc(6), 14bc(2), 17bc(2), 24-bc(3), 80b(1)

ROHR AIRCRAFT CORP.
44abc(10), 46abc(5)

ROME AIR DEVELOPMENT CENTER
12ab(3), 13ab(4), 14ab(3), 15ab(2), 19-ab(4), 20ab(4), 21ab(2), 24ab(2), 32-ab(2)

RYAN AERONAUTICAL CO.
2b, 12b, 13b, 17c, 18c, 25c, 26c, 28b, 29b, 48c, 50b, 58c

SERVOMECHANISMS, INC.
5abcd(10), 8b(2), 13bcd(5), 14a(2), 15-bcd(5), 28bcd(5), 32bcd(5), 40abcd(10), 43b(1)

SIMMONDS AEROCESSORIES, INC.
13a(1), 24ab(2), 35c(1), 40c(1)

SOLAR AIRCRAFT CORP.
11c(1), 13c(1), 26bc(2), 27b(1)

STROUKOFF AIRCRAFT CORP.
11b(2), 13b(1), 23b(1), 27b(1), 80b(1)

SUMMERS GYROSCOPE
50(25), 52(10), 55(30), 65(15)

SYSTEMS DEVELOPMENT, INC.
13b(1)

TELEPHONICS CORP.
13b(1), 21c(1), 22b(1), 33b(1), 59b(1)

TEMCO AIRCRAFT CORP.
12abcd(4), 13abcd(4), 14abc(2), 15abc-(2), 18abcd(4), 19abcd(3), 20abcd(2), 21abcd(3), 24abc(4), 25abc(2), 26abc-(2), 27abcd(5), 28abc(2), 29abc(4), 31-abc(3), 32abc(2), 34bcd(4), 40abcd(2, 41bcd(3), 58b(1)

TRANS-SONICS, INC.
13abc(3), 19abc(6), 23ab(2), 27abc(2) MEabc(2) or M/Pabc(2) acceptable

UNITED AIRCRAFT CORP.
Sikorsky Division
8exp(4), 10b(3), 11exp(1-3), 12exp(1-3), 13exp(3), 14exp(2), 19exp(2), 22exp(1), 24exp(1), 25a(2), 27exp(5), 28b(5), 29-exp(2), 31exp(2)

VAN ZELM ASSOCIATES, INC.
40c(1)

VERTOL AIRCRAFT CORP.
3a(1), 4ac(3), 11a(2), 27ac(2), 31ac(1), 32ac(1), 33ac(1), 34a(2), 35a(1), 39ac-(1), 50ac(1), 52a(3), 53a(1), 80a(1)

WESTINGHOUSE ELECTRIC CORP.
Aircraft Equipment Department
11abc(5), 17b(2), 40b(1), 41b(1), 42b(1)

WIANCKO ENGINEERING CO.
13b(1), 14b(2), 15b(1), 17b(1), 24bc-(2), 27bc(2), 29b(1), 32b(1), 41bc-(2)

WRIGHT ENGINEERING CO.
43a(2)b(1)c(1) or MEa(2)b(1)c(1) acceptable

Mathematics or Physics Degree Preferred

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13ab(2), 14ab(2), 17ab(3), 33ab(2), 40ab(2)

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ALWAC CORP.
17b(1)

AMERICAN BOSCH ARMA CORP.
Arma Div.
2abc(5)

AMERICAN ELECTRONICS, INC.
80a

AVCO
Crosley Div.
15bc(5), 16bc(5), 25bc(5), 32c(2), 39bc(5)

BEECH AIRCRAFT CORP.
10bc(3), 31bc(2), 33bc(2), 34bc(1), 35bc(1), 36bc(1), 41bc(3), 42bc(1)

BENDIX AVIATION CORP.
Bendix Products Div.-Missiles
10b(2), 15b(4), 58b(1)

BENDIX AVIATION CORP.
Bendix Radio Div.
12abcd, 13abcd, 15abcd, 18abcd, 19abcd, 21abcd, 26abcd, 28abcd

BROADVIEW RESEARCH & DEVELOPMENT
7b(1), 42a(1), 58c(1), 59b(1), 64b-(1), 65b(3), 74c(1), 75d(1)

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45c(1), 59c(1), 61c(1)

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13c(2), 15c(1), 17b(1), 18b(1), 24b(1), 25b(1), 27b(1), 28b(1), 33c(1), 41c(1), 50b(2), 71c(1)

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61a(1), 80b(1)

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1957*—42ad(73), 46ab(1), 57ab(5), 72ad(25), 76ab(10)
1958*—42ad(94), 46ab(1), 57ab(5), 72ab(26), 76ab(13)

Atomic Products Div.
1957*—67ad(2), 68ad(404)
1958*—67ad(4), 68ad(595)
Components Products Div.
1957*—11ab(1)
1958*—11ab(1)
Defense Electronics Div.
1957*—14abcd(271)
1958*—14abcd(366)
Electronic Components Div.
1957*—15abcd(38), 24abcd(30)
1958*—15abcd(45), 24abcd(37)
Industrial Electronics Div.
1957*—14abcd(2), 15abcd(15)
1958*—14abcd(15), 15abcd(125)
*Estimated vacancies for year

GENERAL MILLS
Mechanical Div.
16b(3), c(2), d(3), 41c(1), 58b(1), 61d(2)

GENERAL MOTORS CORP.
Allison Div.
15, 32, 39

HAYES AIRCRAFT CORP.
64c(2)

HOUDAILLE INDUSTRIES
Buffalo Hydraulics Div.
10ab, 77abcd

LOCKHEED AIRCRAFT CORP.
California Div.
8a, 16cd, 17cd, 26cd, 39abcd

MANNING, MAXWELL & MOORE, INC.
62c(1), 65c(1)

THE MARTIN CO.
1a(5), 2b(3), 4b(3), 5b(2), 6b(2), 7c(2), 9b(2), 10b(3), 12a(1), 13b(2), 15b(10), 16c(1), 17b(2), 18b(2), 19c(1), 20b(1), 21b(1), 22c(2), 23a(15), 24b(3), 25c(4), 26d(3), 27a(6), 43b(5), 48c(3), 59b(5), 62a(7), 63b(2), 64b(6), 65a(3), 66b(3), 67c(10), 68d(2), 71d(1), 72b(2), 73b(3), 75c(4), 76b(5), 8b(1)

NORTH AMERICAN PHILIPS CO., INC.
Philips Laboratories Div.
14c(2), 24a(1), 61b(1), 65b(1), 68c(1)

NORTHROP AIRCRAFT, INC.
26ab(3), 27a(3), 39ab(3), 58a(3)

OPERATIONS RESEARCH
58a

PLANNING RESEARCH CORP.
57d(3)

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RAYTHEON MANUFACTURING CO.
12c(2), 14b(10), 16b(4), 22b(2), 24b(4), 61c(3), 68c(1)

ROBERTSHAW-FULTON CONTROLS CO.
53b(1), 61bc(1), 80b(1)

SERVOMECHANISMS, INC.
5cd(2), 16cd(2)

SOLAR AIRCRAFT CO.
7c(1), 15c(1)

SURFACE COMBUSTION CORP.
Janitrol Aircraft-Automotive Div.
42bc(1)

TEMCO AIRCRAFT CORP.
1ab(4), 2abc(4), 9abc(2), 10abc(2), 58-b(1), 81b(2)

TRANS-SONICS, INC.
27abc(2)[1]
[1] Elect. or Mech. engineering degrees also acceptable.

VERTOL AIRCRAFT CORP.
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2.0 PROJECT ENGINEERING
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2.2 Airborne Armament
2.3 Air-to-Air Missiles
2.4 Semi-Automatic Test Equip.
2.5 Air Traffic Control
2.6 Optical Systems
2.7 Stabilizing Devices
2.8 Submarine Fire Control
2.9 Electronic Test Equipment

3.0 SYSTEMS EVALUATION
3.1 Instrumentation Evaluation
3.2 Telemetry
3.3 Data Reduction
3.4 Data Analysis
3.5 Project Engineering
3.6 Data Process Planning
3.7 Control Circuitry Design

4.0 SYSTEMS ENGINEERING
4.1 Trajectory Analysis
4.2 Airframe Performance
4.3 Weapons Control
4.4 Operations Research
4.5 Radar
4.6 Error Analysis
4.7 Reliability

5.0 COMPONENTS
5.1 Transistors
5.2 Magnetic Amplifiers
5.3 Synchros
5.4 Tachometers
5.5 Accelerometers
5.6 Resolvers
5.7 Integrators

6.0 RADAR
6.1 CW Doppler Systems
6.2 Antenna Design
6.3 Components
6.4 Pulse Circuitry
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6.6 Laboratory Evaluation

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7.2 Sub-Contracted Liaison
7.3 Contracts Evaluation
7.4 Project Coordination

8.0 DIGITAL COMPUTERS
8.1 Logical Design
8.2 Dynamic Analysis
8.3 Circuit Development
8.4 Component Development
8.5 Packaging
8.6 Field Evaluation

9.0 ENVIRONMENTAL
9.1 Vibration
9.2 Shock
9.3 System Test
9.4 Component Test
9.5 Materials Analysis
9.6 Dynamics

10.0 MISSILE GROUND EQUIP.
10.1 Operations Techniques
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Bantam, Conn.
R. Lautier, Chief Engineer

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George W. Speer, Personnel Dir.

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Robert Burchell

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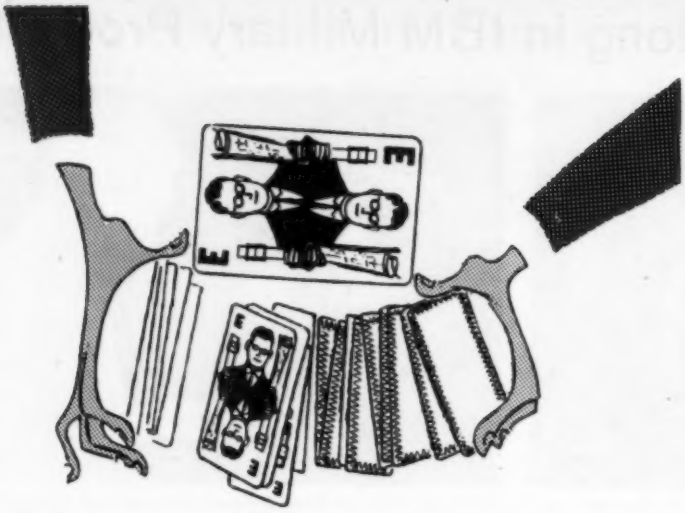

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WEST COAST TALK

by Fred S. Hunter

Here's a clear explanation of those numbers for Boeing jets

THIS IS IN ANSWER to those who keep asking us about the different Boeing jet transport models because they say they are always hearing new numbers. These are the basic models:

707-120: Standard J57-powered model, ordered by such airlines as American and TWA.

707-120B: Short-bodied version of the J57-powered model ordered by Qantas.

707-220: Model 120 converted to J75 power ordered by Braniff.

707-320: Intercontinental model with the big wing and J75 power.

707-420: Big wing airplane with Conway power.

707-520: Model 120 converted to Conway power.

717-020: Proposed small jet. It has been offered to prospective purchasers (no takers yet) with P&W J57, GE J79 or British Avon engines. In Seattle, they call this "the bargain basement special." It is reported to have a base price of $3,600,000.

You also may hear derivatives of the foregoing numbers. They're used to differentiate particular airline configurations. Pan American's Model 120s, for example, are designated 707-121. Same model for American is the 707-125.

J. R. Dempsey, general manager of Convair-Astronautics, is widely known as Jim and it has been generally assumed that his first name is James. Even at Convair. Matter of fact, Convair put out a biography on the man as James R. Dempsey. But truth is his name isn't James at all. He was christened J. Ramon Dempsey and the "J" was merely an identifying initial. The misconception goes back to the time Dempsey entered West Point. He signed in as J. R. Dempsey. "What's your first name?" demanded the sergeant who was filling out Dempsey's papers. "Ramon," replied Dempsey. "What's the J stand for?" "Nothing," said Dempsey. The sergeant cocked an eye. "What do they call you?" he asked. "Jim," Dempsey acknowledged. The sergeant never hesitated. Down it went in the Army records—James Ramon Dempsey.

Looks like North American Aviation's X-15, which is scheduled to take up where the Bell X-2 left off, will be considerably bigger than its predecessor in the pursuit of high-speed, high-altitude research for the Air Force. A Boeing B-50 was big enough to take the X-2 aloft for launching, but North American draws a B-36 from the Air Force for this job with the X-15. Scott Crossfield, former top NACA pilot with experience on the Bell rockets, will fly the X-15.

Attendance at stockholder meetings keeps going up and aircraft manufacturers have to plan for it these days. To be sure there would be room for all, North American held its 1957 meeting in a tent on the employes' recreation grounds. Lockheed, the last couple of years, has borrowed the LERC auditorium in Burbank for its meetings. Now, Douglas has outgrown the hall at the Miramar Hotel in Santa Monica and will hold this year's meeting in the Beverly Hills Hotel in Beverly Hills. Swanky, eh?

Lockheed will start off its jet utility transport project using two British Orpheus engines, one on each side of the fuselage back toward the tail, to power the prototype scheduled to fly this fall. The plane is designed, however, so that at a snap of Kelly Johnson's fingers it may be converted to a four-engine configuration, using General Electric J85s. This will enable Lockheed to make its bid to meet the Air Materiel Command's requirements for an 8-to-10 passenger multijet capable of Mach .76 cruising speed with either a twin-jet or a four-jet design, depending on how things look. It will also give Lockheed a time advantage. The Orpheus engines are available now. Oh, yes, we also hear the four-engine configuration presently favored would have two engines attached to the fuselage and two hooked onto the wing. Different.

Ken Gordon, who used to sell Boeing 707s, has switched from Seattle to San Diego and is now helping Alan Abels sell Convair 880 jet airliners. . . . Another switch: Martha Biskub, the comely lass who did the color styling for the DC-7 line at Douglas, is now on the staff of Walter Dorwin Teague, consultant to Boeing on the 707 interiors.

AiResearch Aviation Service, which has been so successful in developing executive-type interiors for the Convair 240, 340, 440 line, has already developed a design for an executive interior for the Fairchild F-27 and thinks the twin-engine turboprop will be a winner in this field.

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Easy to install in any size aircraft, Puritan Plug-In Valves are a combination of quality materials and fine craftsmanship.

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Aviation Division

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NEW PRODUCTS

Radar tracking system reports 72 targets in three dimensions; called 'hybrid' digital analog system

WESTINGHOUSE ELECTRIC CORP's electronics division in Baltimore has developed a radar "track-while-scan" system that automatically tracks up to 72 targets in three dimensions.

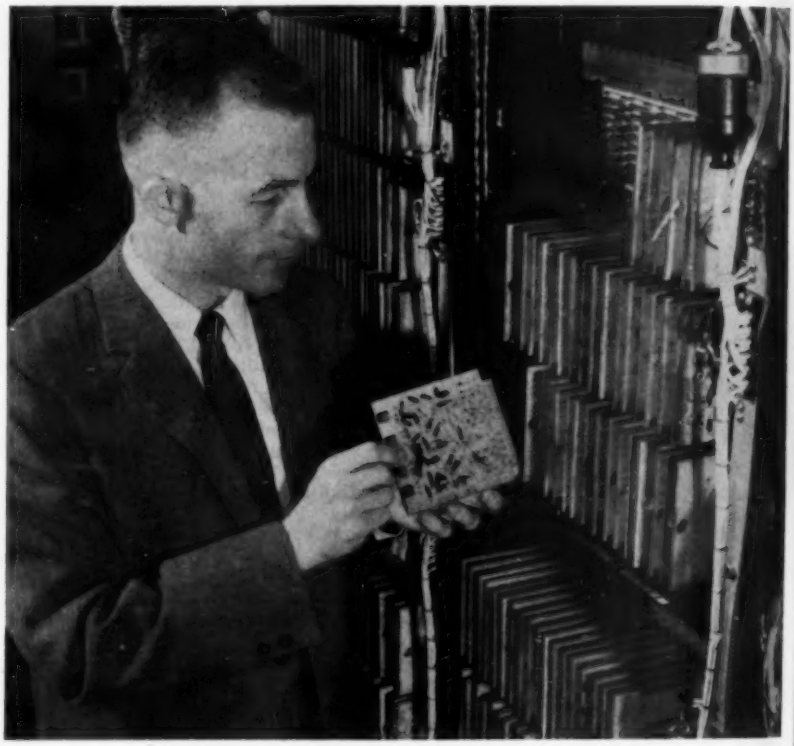
The manufacturer describes this as a hybrid digital-analog system in which error-sensing is an analog function accomplished under the control of a digital computer. The digital computer computes, controls and displays information on all 72 tracks.

Incorported in the system is three-dimensional information obtained directly from a single radar source. Individual monitors for each track are provided. Automatic track fault alarms permit one operator to successfully monitor 12 tracks.

Computer components are made up of plug-in package units, using printed circuits and static components. Each unit of the system weighs about 200 lbs. and has its own transit case.

Approximately 1,500 transistors and 11,000 diodes are employed in the various circuits. Magnetic elements are used where presently available transistors do not have the necessary power-handling capabilities.

Circle No. 83 on Reader Service Card.

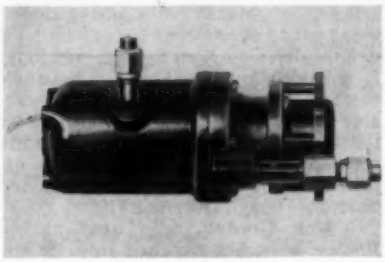


Liquid oxygen storage tanks

HOFMAN LABORATORIES is producing two items for low temperature applications. Liquid oxygen and nitrogen units for in-plant storage and transportation are available in capacities to 3,500 gals. Vessels for bulk storage are sized to 10,000 gals.

Hofman quick couplings utilize cam action to give metal-to-metal medium pressure contact in place of gaskets for positive seal. Require only ¼ turn to open or close. Available in 1, 1½, 2, 2½, 3, 4" sizes.

Circle No. 62 on Reader Service Card.



Seal-less 'canned' pump

APPLIED DYNAMICS CORP. is making seal-less "canned" pumps designed specifically for airborne requirements. Typical unit measures 8" long, 3" in diameter, weighs about 3 lbs. Pump operates on 400-cycle current.

Applications include leakproof circulation of radar coolants and missile guidance system coolants, and pumping of high-temperature hydraulic fluids. Centrifugal and positive displacement designs are available.

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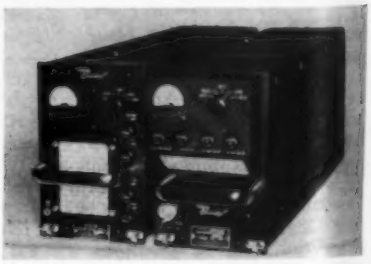

Weather radar transmitter-receiver

Radio Division of BENDIX AVIATION CORP. has released first details of new lightweight airborne weather radar transmitter-receiver.

Unit, designated RDR-10, weighs 26 lbs., is capable of performance of current X-band Bendiz RDR-1, including 150-mile range. It takes up ½-ATR package. With the ½-ATR synchronizer-power supply package introduced in 1956, total rack space for complete system is only one ATR.

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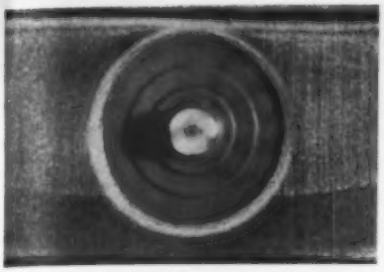


Corrosion-resistant seal

A seal said to be impervious to deteriorating effects of JP-4 fuel has been developed by HAYDON SWITCH CO.

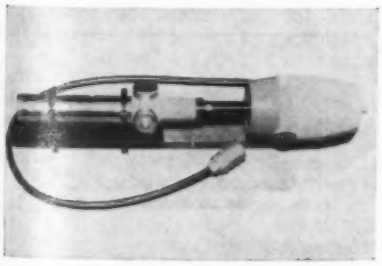
Seal resists JP-4 more than 1 million cycles with immersion of eight weeks. Cycling tests conducted at temperatures of —65 to 250°F without ill effects to seal. Seal withstands 155 psi differential pressure for six hours with no leaks.

Circle No. 76 on Reader Service Card.

Cabin amplifier

TRANSVAL ENGINEERING CORP. has developed an aircraft cabin amplifier weighing less than 3 lbs. Designated TCA-10, the unit is completely transistorized, uses printed circuits. It operates, without power supply, directly from aircraft's primary source.

Circle No. 31 on Reader Service Card.

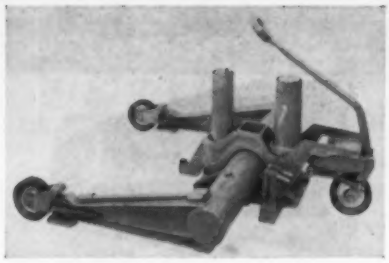


Telescopic alignment kit

Telescopic alignment kit for use by airframe manufacturers' with its closed circuit TV system has been developed by GENERAL PRECISION LABORATORY, INC.

Kit increases efficiency of GPL's Model PD-150 TV system in optical tooling problems by substituting visual communication for verbal or hand signal methods. Kit allows one man to handle alignment work.

Circle No. 65 on Reader Service Card.

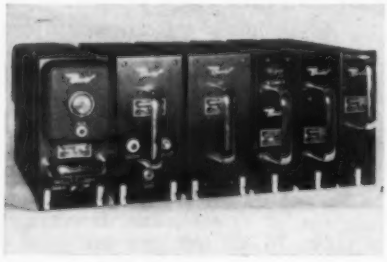


'Crocodile' jack

A 17-ton "Crocodile" jack manufactured by REGENT JACK MANUFACTURING CO. promises to solve problems in aircraft flat-tire replacement.

Jack requires only 3½" clearance from ground and lifts 15". Jack can reach jack points located in otherwise unaccessible spots. Portability allows quick, easy handling of aircraft on runways.

Circle No. 78 on Reader Service Card.

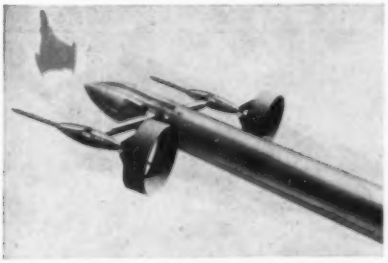


Nav-aid equipment

New communications and navigation equipment that achieves a space saving of 33% and weight saving of 46% is being produced by Radio Division, BENDIX AVIATION CORP.

Equipment includes VHF transmitter and receiver, VOR/LOCALIZER, marker receiver, glide slope receiver, passenger address amplifier.

Circle No. 80 on Reader Service Card.

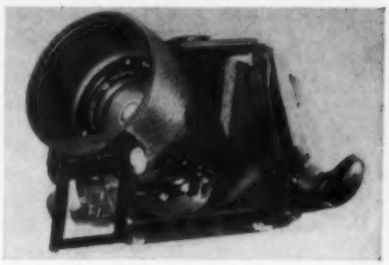


VTOL velocity measuring instrument

TASK CORP. has developed a new type velocity measuring instrument for use at the relatively low airspeeds of VTOL aircraft.

Built for Ryan Aeronautical Co., this instrument is a special wind vane with two degrees of rotation. Weight is less than 2 lbs. Two swiveling heads located on the nose boom tip measure flow direction and pitot-static pressures. Heads freely swivel to allign with airflow.

Circle No. 68 on Reader Service Card.

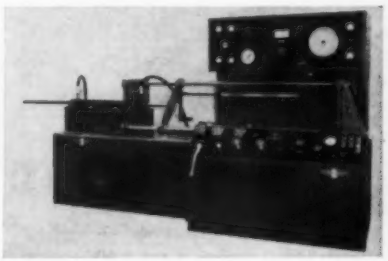


Motorized aerial camera

KONICA CAMERA CO., has introduced a motorized aerial camera for rapid-fire photography. Ten exposures in 15 sec. is possible—a single click snaps picture, advances film, cocks shutter, counts exposures.

Camera weighs 4 lbs., uses 120 film, has 135 mm. f:3.5 fixed-focus Hexanon lens, diaphragm closes down to f:22, shutter speeds at 1/50, 1/100, 1/200, and 1/400 sec.

Circle No. 66 on Reader Service Card.

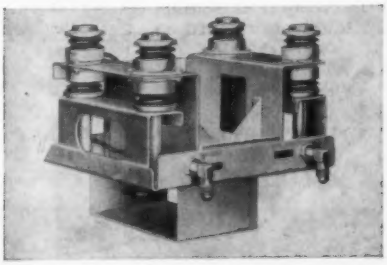


Linear actuator test stand

New linear actuator test stand (NY201) has been introduced by GREER HYDRAULICS, INC. Stand has Baldwin type load cells for measuring operating loads in pounds, achieves accuracy within ±1%.

Stand has timing device for timing actuator travel in in./sec. Linear distance measured by adjustable scale.

Circle No. 75 on Reader Service Card.



Airborne mounting system

ROBINSON AVIATION, INC. has designed an airborne mounting system for vibration and shock protection of electronic and pressurized equipment.

Model 1365 is built to military specs. Stainless steel wire elements have a high percentage of inherent damping. Model has natural frequency of 15-17 cps, vibration isolation is 70% at 40 cps. Unaffected by oils, solvents, water, fungus, temperature extremes.

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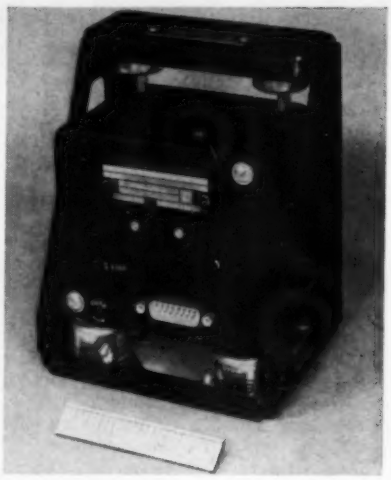
NEW PRODUCTS

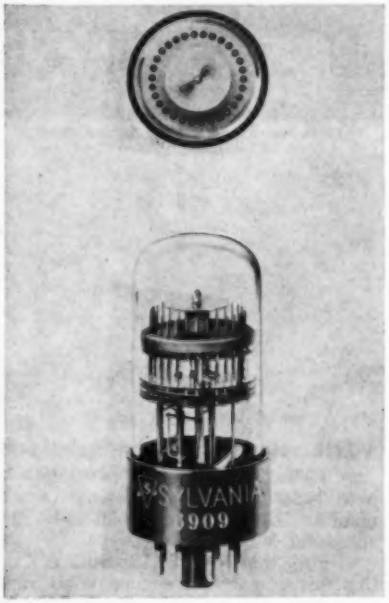


Antenna switch

An automatic antenna switch that monitors an incoming signal and selects the best antenna for dependable reception has been announced by AUTONETICS, division North American Aviation, Inc.

Selector Antenna C-2193/ARC is a transistorized unit occupying 120 cu. in. and weighs 2½ lbs. Power consumption is 70 milliwatts. It operates at up to 70,000 feet, can withstand a shock of 30gs. Switch may be used with Tacan equipment and eliminates "search-track" cycling during switching.

Circle No. 82 on Reader Service Card.



Counter tubes

Two high-frequency counter tubes offered by SYLVANIA ELECTRIC PRODUCTS, INC., types 6909 and 6910, are rated for 100 kc operation. They are particularly suited for nuclear and radiation measuring equipment.

Reliable operation from 1 to 100,000 cycles is said to be obtained from the tubes with power dissipation at about ½ ma. Resolution time between pulses is about 5 microseconds. Tube life is said to be at least 2,000-2,500 hours.

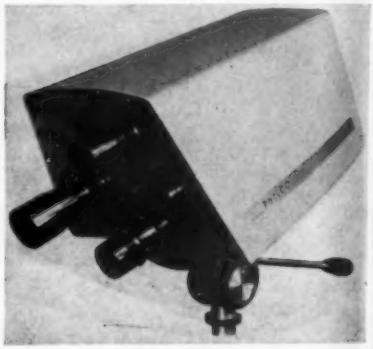
Circle No. 81 on Reader Service Card.

Teflon capacitors

Metallized Teflon capacitors developed by BALCO RESEARCH LABORATORIES have miniature dimensions and give exceptional performance at 200°C. without derating.

Produced under Air Force R&D program, capacitors have following characteristics at 200°C: power factor less than .0005; insulation resistance 10^9 ohms ratings: capacitance .005 to 4mfd. voltage to 1,000 wvdc; tolerance, as low as 1%.

Circle No. 74 on Reader Service Card.



Closed-circuit TV equipment

PHILCO CORP. has developed a new line of closed circuit television equipment for the aircraft industry, said to contain all of the latest developments in cameras, monitors, controls and lenses.

Featured are remote camera controls for adjustment of focus, iris apertures and special weatherproof and explosion resistant housings.

Specifications of equipment are:

	Width	Height	Depth	Weight
Camera ...	3 5/8"	6½"	10¼"	7 lbs.
Control unit	19"	8¾"	14½"	34 lbs.
17" monitor	17½"	14¼"	24"	60 lbs.
Power supply	19"	5¼"	9"	26 lbs.

Circle No. 64 on Reader Service Card.

Ceramic foam

EMERSON AND CUMING, INC. offer Eccofoam LM, a ceramic foam that can be used up to 1,600°F. It has a density of 20 lbs. cu. ft. Resembling damp sand, it is packed or tamped into cavity to be filled. Photo shows Eccofoam cured, molded and after 24 hours at 1,600°F.

Filling of complex volumes or imbedment of electronic items is possible. Other uses: thermal insulation, core for sandwich structures. Compressive strength 400 psi, dielectric constant 1.5, dissipation factor .005.

Circle No. 71 on Reader Service Card.

NEW PRODUCTS

Constant torque motor

WESTERN GEAR CORP.'S Electro Products Division has developed a 400-cycle, 200v., 3-phase, 2-speed constant torque motor. Speeds of 7,200 and 1,200 rpm are available at ¼ hp and 1/24 hp respectively. Output speeds are +5% with controlled acceleration and deceleration. Motor is 2½x6¾", weighs 6½ lbs.

Circle No. 63 on Reader Service Card.

Electro-pneumatic actuator

Electro-pneumatic valve actuator developed by VAPOR HEATING CORP. weighs 1.5 lbs. yet is rated to operate at duct pressures up to 300 psi in air conditioning jet aircraft.

Valves operate at any fixed response time between one and 10 seconds, are usable in duct temperatures of —75°F to 1,000°F. Valves accommodate duct sizes from 1" to 2½" diameter. First unit to be used by Carrier Corp. in DC-8 airconditioning.

Circle No. 87 on Reader Service Card.

Temperature systems tester

TEMPCAL tester, manufactured by B&H Instrument Co., checks thermal switch and continuous wire systems for accuracy either on aircraft or bench. Also checks cylinder head thermocouple systems.

Accuracy guaranteed to ±5°F with temperatures from 0 to 800°F. Master probes for head temperature thermocouples accurate to ±4°C from 0 to +300°C.

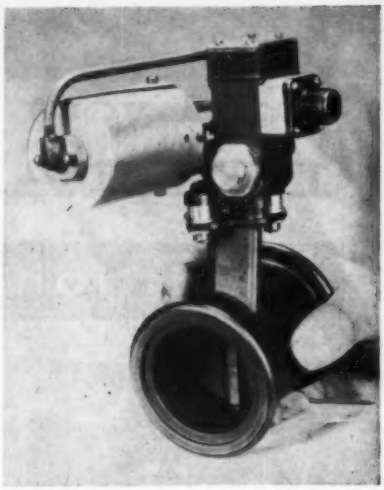
Circle No. 88 on Reader Service Card.

High-altitude connector

CANNON ELECTRIC CO. is featuring a new rack/panel pressurized connector for high altitude and vibration applications. When DPS series connector is mated, it is sealed about insert faces by rubber. Available in 4 sizes.

Cannon has also developed an adapter and coupler for standard AN connectors. This item makes available a full range of sizes of AN plugs and receptables with minimum of tooling costs. Adapter screws over coupling threads.

Circle No. 67 on Reader Service Card.

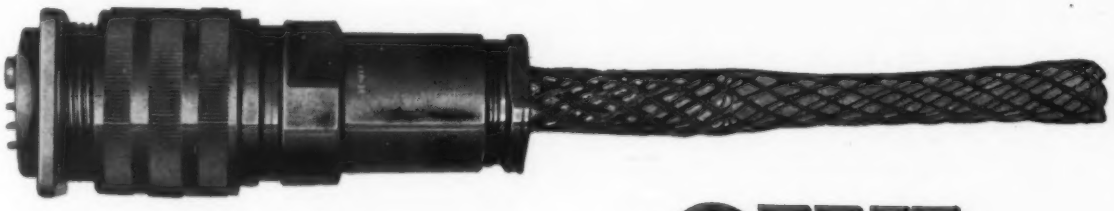


Fuel booster pump

LEAR-ROMEC DIVISION, LEAR INC. is marketing Model RR11530D1 fuel booster Pump. Rated at 4,000 pph at 16 psi nominal for normal duty and 4,000 pph at 25 psi nominal for emergency duty. Rating is 0.35 hp, current drain 19 amp normal and .56 hp current drain 28 amp emergency.

Unit meets hot fuel climb tests from sea level to 25,000 ft. and operates in ambient temperatures from —67° to +160°F. Size 8½ x 13½".

Circle No. 72 on Reader Service Card.



Presenting the New QWL

Bendix ELECTRICAL CONNECTOR

A HEAVY-DUTY WATERPROOF POWER AND CONTROL CONNECTOR FOR USE WITH MULTI-CONDUCTOR CABLE

This new QWL Bendix* Electrical Connector was designed for and is being used principally on ground-launching equipment for missiles and ground radar equipment.

Obviously, for this important type of service only the highest standards of design and materials are acceptable.

That's why it will pay you to specify the Bendix QWL Electrical Connector for any job that requires exceptional performance over long periods of time.

QWL outstanding features:

1. It combines the strength advantages of machined bar stock aluminum with the shock-resistant qualities of a resilient insert.
2. A modified, double stub thread provides for speed and convenience in mating and disconnecting and the special tapered cross-section thread design resists loosening under vibration. The threads can be easily hand cleaned if contaminated by a substance such as mud or sand.
3. An Alumilite 225 hard anodic finish is used which gives a case hardening to the aluminum surface. This finish offers outstanding resistance to corrosion and abrasion.
4. The cable-compressing gland used within the cable accessory accomplishes both a firm anchoring of the cable and effective waterproofing for multi-conductor cables. Neoprene sealing gaskets are used at every joint to insure a watertight connector assembly.
5. The cable accessory is designed to accommodate a Kellems stainless steel wire strain relief grip for additional cable locking.
6. A left-hand thread is used on the cable accessory to prevent inadvertent loosening.
7. High-grade copper alloy contacts are used which provide for high current capacity and low voltage drop. The famous Bendix closed-entry socket is used for contacts sizes 12 and 16.

*TRADEMARK

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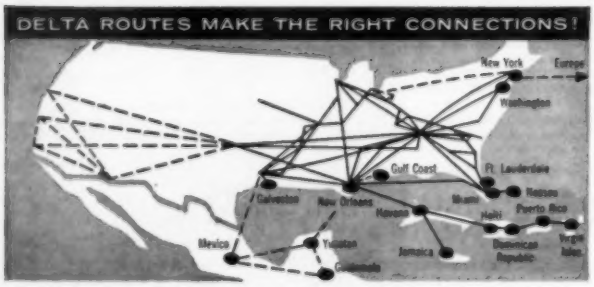


25 PARTICIPATING AIRLINES LISTED IN FOLDERS

Allegheny	Continental	Mohawk	Piedmont
American	Cubana	National	Southern
BOAC	Eastern	North Central	Trans Canada
Braniff	KLM	Northeast	Trans Texas
Capital	Lake Central	Northwest	TWA
Central	Mackey	Ozark	United

Pan American

How customs plans to handle jet traffic

Streamlined Supermarket operation will cut red tape, move passengers through Idlewild quickly, efficiently

by Eric Bramley

THE JET AGE arrives next August for the U.S. Bureau of Customs.

About that time, a customs facility will go into operation at New York International Airport that probably represents one of the most sweeping changes in the Bureau's 168-year history. It is expected that similar facilities will be installed at other airports handling international traffic.

This is part of Customs Bureau program to prepare for jet air travel—to streamline its operations in keeping with the increased speed of the jets.

One official estimates that at Idlewild you'll clear customs in half the time required at present.

Into the ashcan will go all the traditional facilities and customs clearance methods that have irritated and confused travelers.

In their place comes a new "supermarket" concept that will see passengers claim their own baggage and take it to any one of a large number of supermarket-type check-out counters where they will be cleared.

The airlines, U.S. and foreign, are enthusiastic about the new concept. They're spending between $350,000 and $400,000 to alter the interior design of the Idlewild customs hall in the new International Arrival Building to accommodate the facilities. Procedures, incidentally, were worked out in cooperation with the airlines.

The Bureau of Customs has often been called stodgy, non-progressive and a hindrance to the development of international travel. This cannot be said of the present regime. The fur has been flying ever since David Kendall took over under the present Administration as Assistant Secretary of the Treasury (Customs functions under Treasury), and Ralph Kelly became Commissioner of Customs.

Idlewild: 'front window' of U.S.

Kendall has emphasized that a foreigner flying to this country to some extent forms his initial impression of the U.S. from the airport at which he lands and the manner in which he is treated by government officials. He refers to Idlewild as "the front window of the U.S. It should be the showplace of the world, customswise."

These sentiments are echoed by Commissioner Kelly. "Our aim is to get people through customs faster and more pleasantly—without pushing them around. It's easier to be pleasant to people than to growl at them."

About a year ago, Kendall set up a top-level government-industry committee to look into the whole problem of customs facilities and procedures at airports. Members are Kendall; Kelly; Assistant Commissioner David Strubinger; Frank Laughlin, Assistant Collector of Customs, New York; Ed Thompson, Customs' air coordinator (the Bureau, incidentally, does not have a coordinator for any other form of transportation); Stuart G. Tipton, president of Air Transport Association; Harold Gray, executive vice president of Pan American World Airways' Atlantic Division, and John Clemson, TWA's vice president-passenger service.

Under this committee, task forces went to work on a large number of problems. And Idlewild was the port at which the jet age planning started. Here Customs was faced with the hard fact that whereas it cleared about 800,000 people through this terminal last year (this figure includes a large number from Canada), its estimate for 1960 is 1,560,000—almost double. Obviously, present procedures would be inadequate.

Under these present procedures, a passenger proceeds through public health and immigration to the customs area, equipped with low counters for baggage examination. Baggage is brought in on carts behind the counters and then must be distributed along the counters under the correct letters of the alphabet (a passenger with one or two bags may have one delivered on the first cart and the others on another cart several minutes later, resulting in further delay).

How supermarket idea was born

When an inspector finally becomes available and completes his job, a green stamp is affixed to each bag (if duty is to be paid, another office must be visited). On the way out the door, the passenger stops while the stamp is stamped. Particularly at peak periods, it is a time-consuming, irritating operation.

In seeking improvement, Customs and the airlines reasoned that the ideal

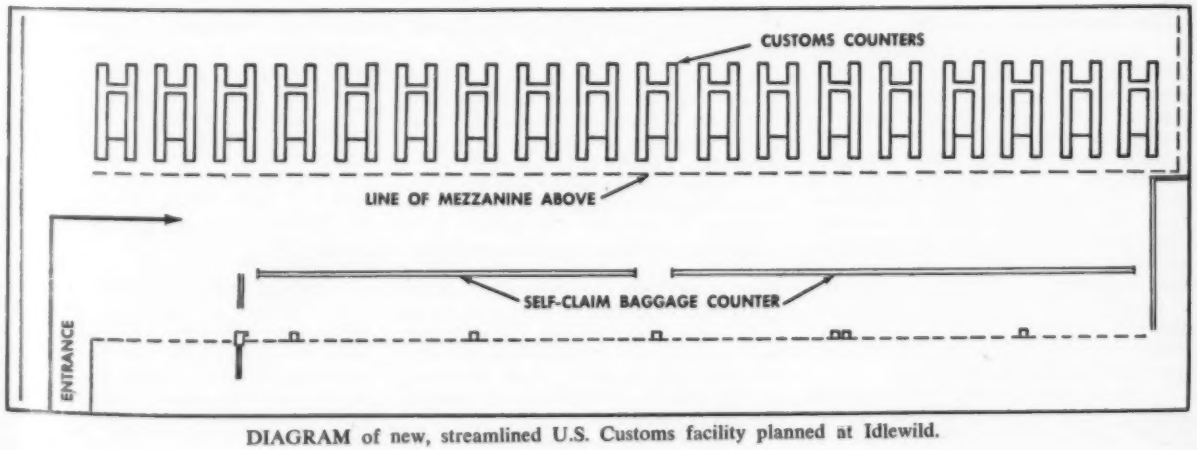


DIAGRAM of new, streamlined U.S. Customs facility planned at Idlewild.

arrangement would be to get the passenger, all his bags and all his documents before an inspector stationed at a fixed position. And thus the supermarket idea was born.

At Idlewild, after clearing public health and immigration, a passenger will enter the customs hall under a sign welcoming him in five languages and directing him to the self-service baggage area. To eliminate confusion in this area, signs will indicate the location of baggage (bags from PAA Flight 100 in Bin 19, for example).

When a passenger has secured all his baggage, he proceeds to one of many supermarket counters for inspection. The counters are immediately adjacent to the claim area. The passenger is not directed to any particular counter; he selects the one with the shortest line.

At the counter he places baggage on a conveyor belt, which the inspector operates with a foot pedal. The belt carries the bags to the examination counter where the inspector completes his work. If duty is to be paid, it is collected at this point, thus eliminating the necessity of visiting another office. Once he is past this counter, the passenger is free to go on his way—no more stamps, etc.

Seventy-two counters are being installed, 36 on each side of the building. Present volume of traffic will not require that all of them be manned; the 72 positions allow for future expansion. A couple of counters probably will be set aside for cripples, stretcher cases, etc.

With all 72 positions fully manned, Customs believes it will be possible to clear 20,000 persons in 24 hours. For the present, with no increase in manpower, clearance is expected to be speeded by 50%.

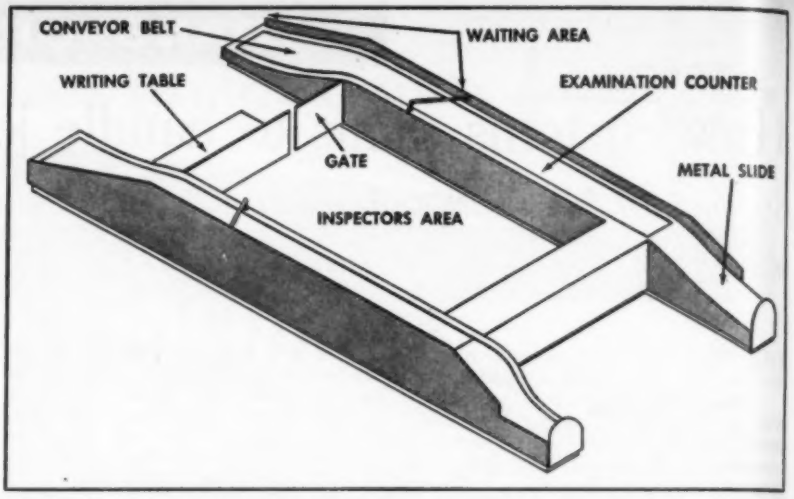
The supermarket concept is adaptable to any terminal. It will definitely be installed at Honolulu, and 10 to 15 other airports are under consideration.

And to go with these jet age facilities, Customs plans to "renovate" its personnel. "Particular attention is being paid to obtaining officers who possess necessary personal qualifications of appearance, manners, courtesy, etc.", the Bureau says.

Other improvements made

Kendall's top-level committee and task forces have also made other improvements. Baggage procedures were studied, forms were revised, paperwork connected with the handling of unaccompanied articles was reduced. Passengers were permitted to carry their own baggage declaration forms from airplane to customs, a considerably faster method than having them collected by the flight attendant and sent in separately. In-transit passengers —people traveling from abroad through the U.S., without stopping, to another country—were no longer subjected to a complete baggage inspection.

It was also decided to try a completely "oral declaration" on certain flights coming into Miami. Under this



CONVEYOR BELT SYSTEM will help speed up U.S. customs operation at New York International Airport.

method, if a returning U.S. citizen was within his duty-free exemption on articles he had purchased abroad, he merely said so, and there were no forms to fill out.

Customs officials say this experiment was not too satisfactory. If passengers were correctly briefed on the procedure by the flight attendant before landing, there was no hitch. But if the briefing was not thorough, confused passengers were sometimes faced with the job of filling out a complete form when they arrived at the customs counter.

(There are those in the airline industry who feel that oral declaration can be made to work, and that it will eventually be adopted.)

However, the oral experiment led to a somewhat revolutionary change—the adoption of the new, simplified baggage declaration form now in use at all ports. The old form was a hodgepodge that no one was ever sure he had completed correctly. It required listing all articles purchased abroad.

Even the opening paragraph of the new form was a surprise: "The United States Customs Service extends to you a most hearty welcome on your arrival in the United States . . ." Observers noted that this was the first time Customs had shown cordiality toward arriving passengers.

If, on the new form, you can answer "no" to five questions regarding purchases abroad, and if you're within your exemption, no listing of articles is necessary. The form is complete.

Despite these improvements, however, Customs' biggest worry has been facilities at airports. The Bureau is in a peculiar position regarding these facilities. It needs adequate space, but it doesn't pay for that space. Facilities are either furnished by the airport or paid for by the airlines. "The people who pay for the facilities ask us what we need and it's up to us to tell them, to the best of our ability," a Customs official explained.

"Lots of new airport terminals are being built. They have lots of ticket counter space, restaurants, bars and other conveniences. But sometimes they forget that government agencies have to function in connection with international traffic. And if adequate facilities aren't available, they're dead. With the growth of travel, they'll have a serious bottleneck in their new terminals."

Customs has been well aware that introduction of jets will mean that more people will be carried faster than ever. And probably more inland airports will be receiving international traffic. Its problem has been to try to assure that airports, both inland and on the borders, make provision for adequate facilities before freezing their building designs.

Commissioner Kelly has pointed this out to his district collectors. "The Bureau has been studying various methods for processing passengers' baggage and cargo, and has accumulated a body of knowledge which should be of value in determining the customs needs at any of the airports which may be contemplating constructing new facilities," he said.

"For example, at an airport which is likely to receive a large volume of passenger traffic, examination counters of the old, traditional pattern would be unsatisfactory. It is, of course, vital that the plans for customs facilities which will meet our needs be prepared and approved before construction of the terminal begins. Therefore . . . it is requested that all *preliminary* plans for customs facilities for any airport terminals in your district be submitted to the Bureau for its consideration . . ."

Correction

Capital Airline's figures for Percent Change of Revenue Passenger Miles and Percent Available Tonmiles Used for Calendar 1956, as reported in AMERICAN AVIATION Feb. 25, p. 78, were in error. Figures should have read: 27.1 and 45.92, respectively.

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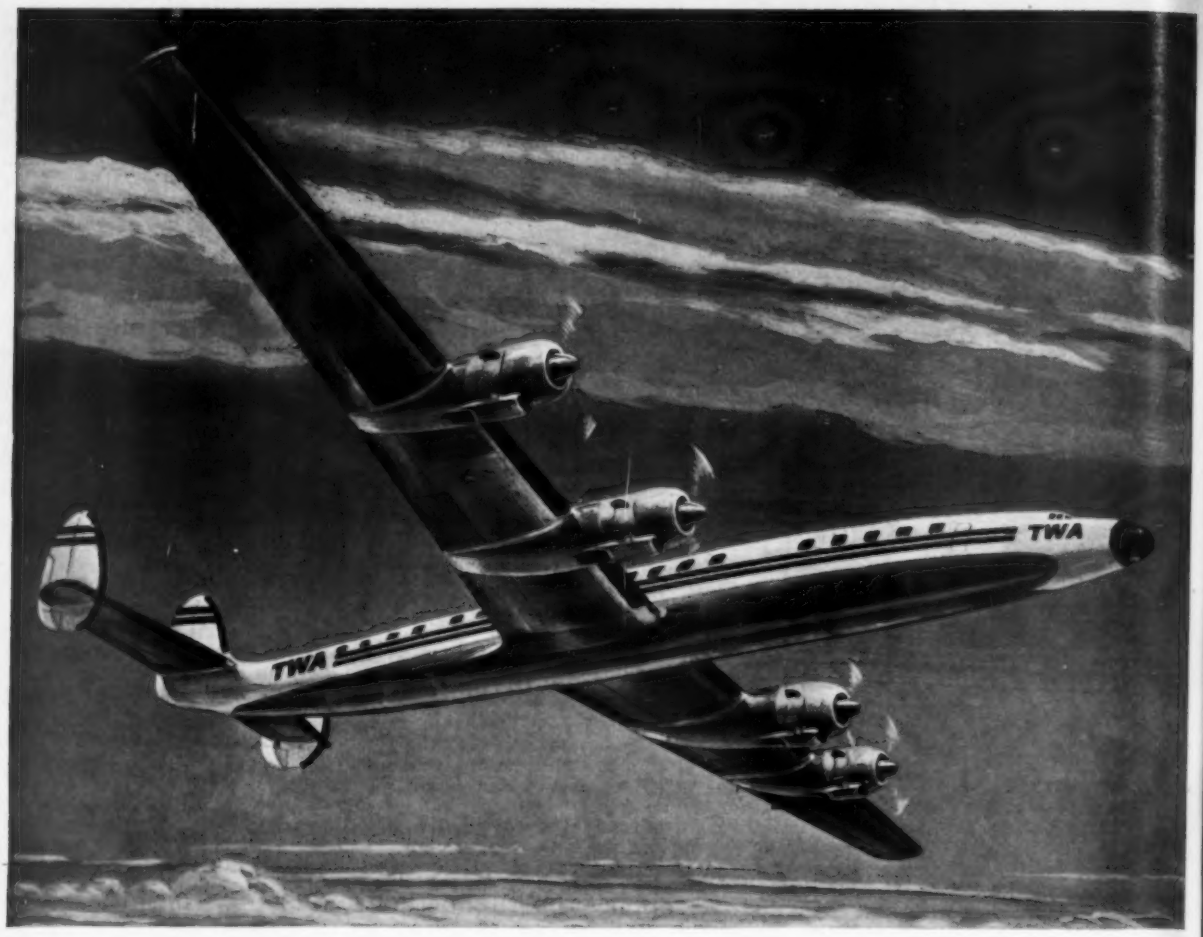

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UAL cuts inspection costs with X-ray

Hospital-like X-ray techniques, virtually unheard of in airline operations five years ago, have assumed an "extraordinary" role in the day-to-day maintenance and overhaul of airline transport fleets.

Since 1951, when first employed in a fleet-wide emergency inspection of propeller blades on American Airlines fleet of Douglas DC-6s and Convair 240s, industrial X-ray has moved into the maintenance shops of every major carrier. And with it have come vast savings over past practices used to inspect hidden aircraft structural areas.

A good case in point is experience at United Air Lines, one of the biggest and most versatile users of X-ray for aircraft maintenance. With only three years of X-ray experience under its belt, United today averages about 80 pictures a week and saves thousands of dollars in the process.

Much Time Saved

It formerly took UAL approximately 30 manhours to open up, inspect and then close up a spar cap or stringer at the fuselage juncture. With X-ray, it takes only two hours, about 7% of the former time.

To open up a DC-6 fuel bladder cell area for inspection of a spar cap or stringer, then close up and test would take about 15 manhours. X-ray takes only two manhours.

• **Back in 1954** when UAL decided to check the interior of the rudders of all DC-4s and DC-6s, the routine of removing the rudder, conducting the inspection, reassembling the parts and test flying the airplane would have involved some 1,440 manhours and cost $15,000. X-ray cut this job to about 270 manhours and cost to only $3,000.

In a more recent role, involving the modification of fuel injection lines on Wright R3350 Turbo Compound engines, United used X-ray to inspect the bonding between fittings and tubing. This single project saved the airline an estimated $32,000 by enabling local manufacture of an acceptable fuel line.

X-ray was used for 100% inspection of these lines. At first, the rejection rate ran as high as 90%, but through the information gained via X-ray, the producer was able to improve fabrication techniques until these rejections dropped below 10%. And of these, all were recoverable by rework.

In all, the use of X-ray for continued receiving inspection and maintenance of fuel injection lines saves an estimated $35,000 annually, UAL officials say.

Policy at United is to use X-ray to locate structural failures or defects that cannot be detected by other known means or without complete disassembly of certain structures. It is used only in those instances where it is the best tool for the particular job and will provide an extra margin of safety against deterioration that cannot be recognized by other means.

Exacting Inspection System

The "extraordinary" label with which United's maintenance manual tabs the X-ray inspection method represents the most exacting inspection level the carrier employs. The engineering structural inspection specification used by UAL at its San Francisco base now calls for about 40 X-ray photos taken at varying time intervals on DC-6 and DC-7 type aircraft and about 64 pictures on the Convair 340.

In both instances, most of the pictures are concentrated along the wing spars. However, special shots are taken in various other aircraft areas as needs might dictate. In the past, these have included such components as door and window frames, fuselage stringers and frames, tail structure, wing stringers and fuel tanks—the latter a sealant examination.

• **In addition,** the inspection is applied to aircraft and engine parts that can be moved into United's special lead-line X-ray room. On the list for this type handling are vendor parts undergoing receiving inspection, such as the R3350 fuel lines, as well as components having concealed wiring and parts. These latter include electrical plugs, cords, tubes, thermocouples and coaxial cables.

X-ray is also used to assist UAL's welding shop in its program to improve techniques. Here, welds are X-rayed to examine penetration, porosity and fusion. Other duties served by X-ray include experimental service for maintenance base shops and engineering, and special inspection service for internal examination of parts to check clearances, radii, wall thicknesses, corrosion, fit, etc.

UAL X-RAY specialist Frank George studies radiograph of DC-6 fuel tank compartment. Use of X-ray cuts job from 15 to two manhours.

Although the final time figure varies depending on the number of pictures taken, UAL averages two hours from the X-ray shot until results are known. If necessary, answers can be expedited in one hour and a preliminary reading can be taken in 30 minutes.

Good Safety Record

And although exposure to X-radiation or gamma rays can cause serious injury, UAL's three-year operation has been accident free, primarily the result of elaborate precautions to protect personnel.

For example, its entire facilities and procedures were patterned to meet all government recommended standards and requirements for radiation safety.

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*"Teflon"—DuPont trade name for Tetrafluoroethylene resin

Independent radiation laboratories have been retained to survey both facilities and processes to report on their adequacy and recommend improvements.

United also has purchased its own radiation survey meter to measure radiation levels where X-ray is being used in open areas. Unsafe areas are roped off, danger signs posted, and the area well marked with flashing red lights.

No one except an operator is permitted within the roped area and then only when the machine is not operating. Operators work in well-coordinated teams and wear special shop coats identified with large red X-RAY painted on the back.

All personnel who work in areas where X-ray might be used are instructed about the dangers of radiation and United's safety rules.

All portable parts, including a complete engine power pack, can be X-rayed in UAL's special lead-lined room where there is a maximum protection against radiation, including an electrical circuit which automatically shuts off the X-ray if a door is opened.

In addition, all operators wear radiation detection badges. Every month, each badge is sent to a radiation detection laboratory in Palo Alto, Calif, where the amount of radiation received by an operator is measured. All operators are given a physical examination before working with X-ray and undergo a thorough blood test as a follow-up every three months.

The safety of the entire operation is periodically checked by the local county industrial hygienist as well as United's own medical and safety departments.

For organization purposes, UAL's X-ray activity is combined with its nondestructive testing laboratory under its maintenance base inspection and quality control division. X-ray operaton are chosen from among aircraft inspectors who have had several years experience with aircraft structures.

Once selected, they receive formal instruction on the theory, safety and proper handling of X-ray equipment. This is followed by on-the-job instruction plus study of text material. The more simple X-ray operations are mastered first, with final viewing of pictures left until the new operator gains sufficient experience to make interpretations.

X-RAY TUBE is maneuvered to X-ray DC-6 rudder tab mechanism.

• **United's entire** inspection operation is now handled by a single X-ray unit—a portable type produced by the C. H. F. Muller Co. of Hamburg and distributed in the U.S. by North American Philips Co. The Norelco unit is rated at 160 kv, 6 ma, 1.5 mm focal spot. The tube weighs 143 lbs. and the control unit 88 lbs. Complete cost including a hydraulically operated mobile stand was $7,500 in 1954.

Besides the basic X-ray device, UAL's equipment includes two illuminators. One unit supplied by General Electric is fluorescently lighted for quick preliminary checks in the dark room and costs $25. Another, a high intensity unit for interpretations, cost $275 and was produced from Keleket X-ray Corp. of Covington, Ky.

UAL also procured a densitometer for checking film densities ($375) and a survey meter for measuring radiation ($325). The densitometer was produced by Welch Scientific Co. of Chicago and the radiation meter by Tracerlab, Inc. of Richmond, Calif.

Riddle wants 3-4¢-a-mile 'air truck'

by Wallace I. Longstreth

Riddle Airlines is planning to make a success out of the airfreight business, so it's looking for a high density, low-cost all-cargo airplane.

Riddle has made some preliminary design studies and here is what it wants:

A high-wing air truck, 90 to 100 feet long, capable of operating at 3¢-to-4¢ per ton-mile. Divided into five compartments, 13 feet by 13 feet, the plane would be able to haul 20 automobiles. Compartmentation should be removable so that the plane could be used to haul other types of commodities.

The airline will not insist on either front or rear loading, although loading from one end or the other is preferable. For many shipments, floor space is a critical item, and Riddle would like its new plane to be two-storied. Again, the airline wants this second floor removable so that oversize pieces of airfreight can be carried.

How long it will be before Riddle gets such an airplane, John Paul Riddle, president, can't say. He does feel that such a plane is coming and that it will be here within the next 10 years.

By then, Riddle believes cargo traffic will have caught up with, and passed, passenger traffic.

Converted C-46 fills gap

Meanwhile, Riddle engineers headed by Norman Golden have developed a C-46 conversion that increases cruise speed by 45 mph and boosts payload by at least 2,000 pounds. Riddle's version, the C-46R, has been granted a T-category certificate by Civil Aeronautics Administration at 49,900 pounds, gross takeoff weight. The plane can be operated for either passengers or cargo, Riddle says it may prove to be the interim answer for the DC-3 replacement.

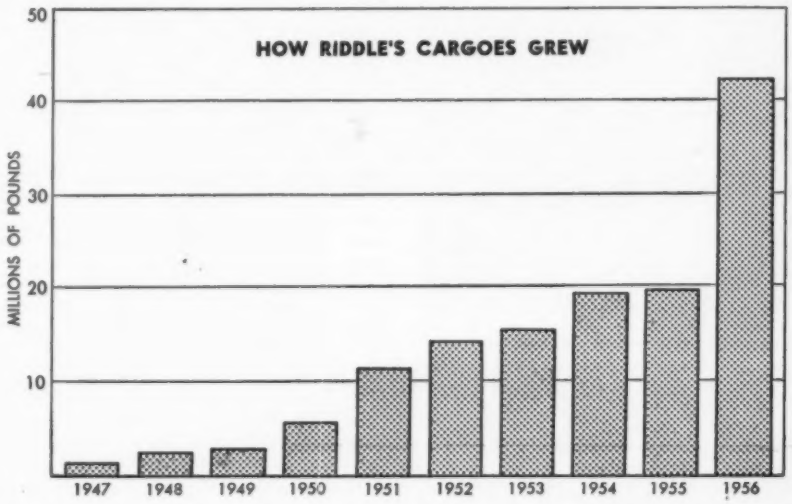
The plane will cruise at 235 miles per hour. It will make the New York-Miami run with a full load of 50 passengers or 13,500 pounds of cargo in 4 hours and 50 minutes. The unconverted C-46 makes the trip in 5 hours and 50 minutes with 11,500 pounds of cargo.

Operating costs per ton-mile of the C-46R will be from 10% to 20% lower than the plain C-46. To Riddle, this means a drop from about 11¢ to 9¢ per ton mile. Riddle believes further reduction may develop as operating experience is acquired. As yet, however, he sees no rate reductions for the shipper resulting from the improved performance.

"There are just too many other costs which have steadily gone up," the Riddle chief said, "so rate reductions will simply have to wait until we get a little meat on our bones."

The airline has 32 C-46s which it plans to convert in its own shops. The company is also prepared to convert C-46s of other carriers and is considering a licensing arrangement that will permit other outfits to perform the conversions under Riddle supervision.

Riddle said his company has already signed such a franchise agreement with Aeronavali of Venice, Italy, to perform conversions for European C-46 operators. Three conversions are under way in Venice. In all, Riddle figures there are some 800 C-46s scattered around the world which could be placed in scheduled service when modified to T-category requirements.



Reasons for growth

The improved characteristics which the C-46R will bring to Riddle's fleet makes 1957's outlook bright, according to the airline's head. He predicted that his airline will haul upwards of 60,000,000 pounds of cargo this year. In 1956, the airline hauled over 42,000,000 pounds—more than double the 19.6 million hauled in 1955.

New equipment and new routes plus an aggressive sales force, headed by Charles Hood, were largely responsible for Riddle's tremendous growth in 1956. More C-46s were acquired, a DC-6A was leased from the Air Force, and the line opened routes from points in Florida to middle western cities such as Chicago, Detroit, Cincinnati, and Cleveland.

The sales force, now about 50 people, located traffic where it had not existed before, to correct the directional imbalance which for years has produced a lot of cargo moving southward but very little in the opposite direction.

Hood and his crew scouted the markets of Florida. Soon planeloads of cut flowers and fruits and vegetables were making northbound trips. Another 6,000 pounds a night was picked up from Florida Fashions, a mail order concern in Orlando that has built a business selling apparel from Florida to northern consumers by featuring the speed of air freight service. Regardless of how large the order is, the firm advertises, a dime pays the air freight charges. Riddle gets full airfreight rates.

Other deals in works

Pending is a deal to fly fresh orange juice from Florida's citrus groves to major markets in the north. Another deal with North American Van Lines will enable Riddle to handle shipments of household goods moving in either direction.

Riddle doesn't just locate and fly the cargo, but is prepared to move the shipments from door to door with proper handling. In New York, for example, the flowers flown up from Stuart, Palatka and other Florida points are handled by Cosmar Florist Delivery Service.

In February, this year, Riddle opened its Norfolk, Va. station, a point which ties in well (though not connected with) Riddle's military route

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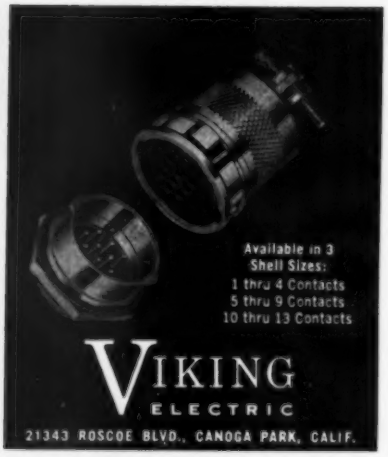

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contracts (Logair).

The Logair contracts, worth $10 million spread over a three-year period, bring in about a third of Riddle's total revenue. The contracts run until the middle of 1959.

Another big assist is expected when Riddle takes delivery of the first of four DC-6As on order. Delivery is due in October. The other three are slated for delivery in 1958. Riddle does have one DC-6A that makes a daily roundtrip between New York and Miami. Martin Zager, manager of Riddle's New York station, says the plane operates at capacity in each direction.

These developments are viewed with enthusiasm by John Paul Riddle. He believes that, when costs per ton-mile drop to around 3¢, airfreight will move in on the truckers just as air passenger business has moved in on the rail and bus lines. At the same time, he tempers the "go get 'em" approach with the warning to "make haste slowly."

Air freight hassle: should forwarders have same minimum rates as carriers?

Civil Aeronautics Board will be called on shortly to decide whether air freight forwarders should be subject to the minimum freight rates which the agency imposed on the remainder of the air freight industry almost nine years ago.

The "direct" air carriers, i.e., those that physically operate airplanes, are unanimously opposed to the continued exclusive position of the "indirect" carriers—the forwarders. A majority of the forwarders have stated no opposition to a potential CAB order which would impose minimum rates on them.

But some seven (of 31) forwarders have voiced strong opposition and have in their corner a big vote—that of CAB Examiner Herbert K. Bryan.

The case goes back to October 20, 1955 when Slick Airways petitioned CAB to establish the same minimum rates for forwarders as existed for direct carriers since CAB's initial minimum rate order of June 2, 1948.

On December 4, 1955, CAB instituted an investigation to "determine whether minimum freight rates and charges previously prescribed, or separate minimum rates and charges should be prescribed for air freight forwarders." Hearings have been held, Bryant's report has been issued, and the case is ready for oral argument before the Board.

Here are the pro and con arguments of some of the major parties to the case:

CAB Bureau Counsel: "The existing minimum rate order should be amended to include air freight forwarders for all shipments 100 pounds and over." CAB attorney John M. Lothscheutz based the position on the argument that forwarders and air carriers are in direct competition for shipments in "the higher weight categories" and that forwarders should not be provided a rate advantage over direct air carriers in order to compete for air freight traffic.

W.T.C. Air Freight (Los Angeles forwarder): "Forwarders are an important instrumentality for promotion of air transportation complementary to, rather than competitive with, the direct carriers, and are entitled to reasonable freedom and protection accordingly."

"The air freight forwarder," W.T.C. attorney Samuel W. Earnshaw said, "must be free to promote new business, to engineer and articulate air freight to the shipping public on a broad-scope, high-quality basis, and above all achieve the overall economies of stimulation, efficient handling, and consolidation essential to the development of tremendous volumes of business new to air transportation and diverted primarily from surface carriers . . ."

The Flying Tiger Lines: ". . . merely because of an accident of time (forwarders were not licensed in 1948) the airfreight forwarders were not encompassed by the minimum rate order from its inception . . ."

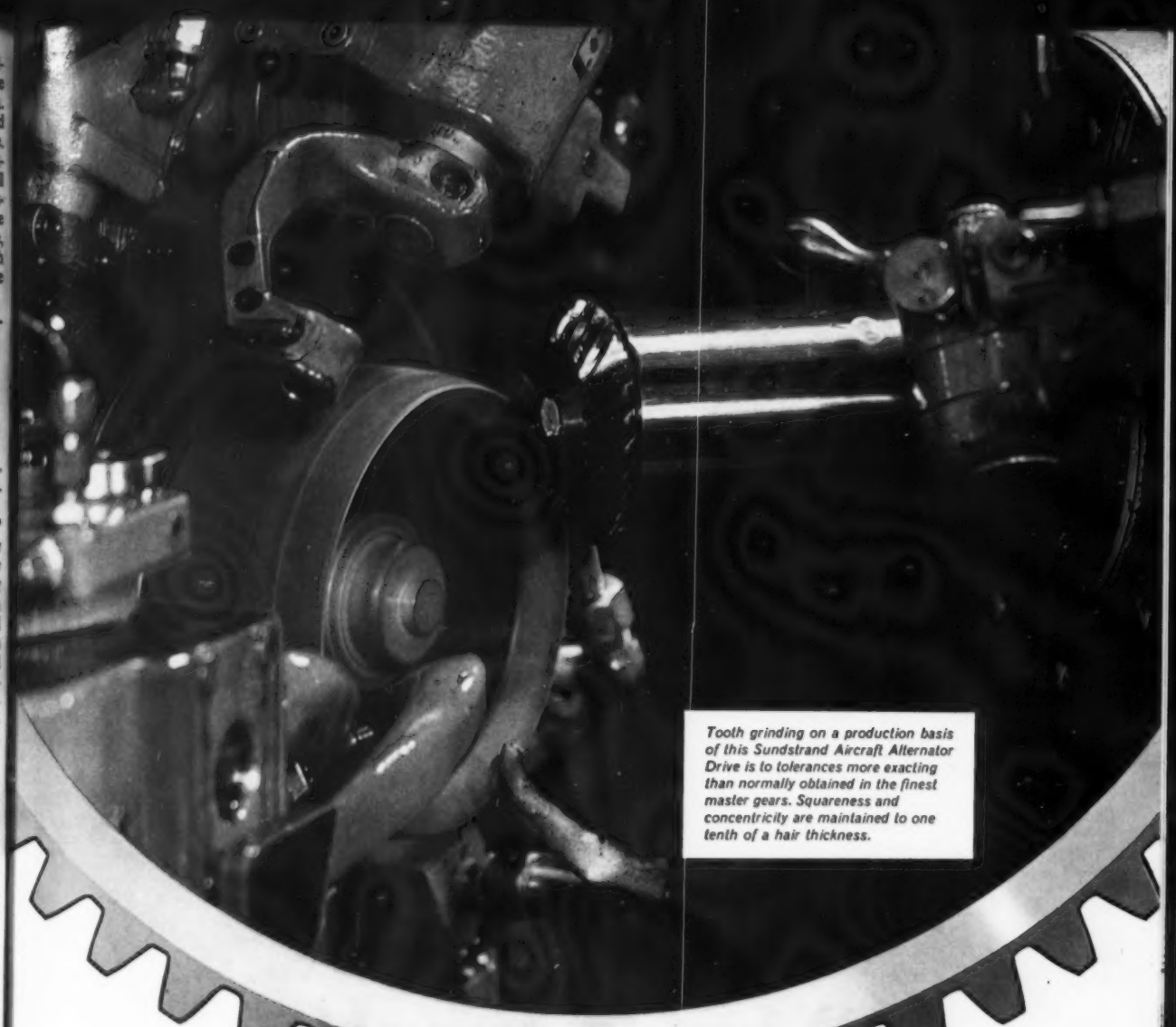
FTL attorney S. P. Meyers said "a rate advantage to the forwarder will inevitably create a greater concentration of traffic in the hands of the forwarders. The forwarders will more and more take over high yield traffic and ship it on direct carriers as low yield traffic without a corresponding reduction in direct carrier costs."

Examiner Bryan, according to Flying Tigers, "completely ignores the situation which prevails at the present time whereby a forwarder may sell a direct carrier's service at rates lower than the direct carrier itself may sell the same service."

American Airlines: "The sound development of airfreight is imperiled by the present discriminatory application of the minimum rate order." Peter S. Craig, AA counsel, emphasized there is no question of requiring competitive rates between airlines and forwarders or no question of eliminating experimental or promotional rates.

"All that the airlines request," Craig said, "is that the same minimum be made applicable to all air carriers so that no air carrier continues to have legal protection from competition."

It should be noted that CAB-prescribed minimum rates are not the rates which must be charged but, provide a floor below which no carrier may set rates without CAB permission.



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Summary of Airline Traffic for January 1957 vs. January 1956

Compiled by American Aviation Publications from Official C.A.B. Data

Airlines	Revenue Passengers (In Thousands) [1] 1957	[2] 1956	% Change	Revenue Passenger Miles (In Thousands) 1957	1956	% Change	Total Ton-Miles Rev. Traffic 1957	1956	% Change	% Available Ton-Miles Used 1957	1956
DOMESTIC											
American	574,661	565,950	1.5	400,426	354,653	12.9	47,612,530	42,088,739	13.1	59.0	61.5
Braniff	157,896	141,312	11.7	67,882	53,227	27.5	7,178,762	5,618,194	27.8	47.3	54.1
Capital	266,506	196,928	35.3	98,514	63,263	55.7	10,139,335	6,734,912	50.5	46.5	43.4
Caribair	20,112	15,629	28.7	1,467	1,317	11.4	159,081	124,530	27.7	57.9	55.7
Continental	60,828	52,437	16.0	22,695	19,464	16.6	2,373,777	2,037,416	16.5	45.9	44.5
Delta	215,716	182,130	18.4	111,051	87,606	26.8	11,897,506	9,410,821	26.4	52.8	57.2
Eastern	608,588	597,768	1.8	376,887	337,112	11.8	39,073,303	37,618,169	3.9	42.3	49.1
Hawaiian	29,378	29,506	—0.4	4,505	4,052	11.2	494,350	477,945	3.4	55.3	48.9
National	138,261	124,666	10.9	98,779	95,848	3.1	10,472,985	10,660,877	—1.8	49.5	65.6
Northeast	37,238	31,646	17.7	8,748	6,546	33.6	883,757	644,568	37.1	38.6	53.3
Northwest	93,612	98,818	—5.3	64,512	65,029	—0.7	7,403,375	7,557,180	—2.0	48.1	53.1
Trans-Pac.	NA	13,110	NA	NA	1,658	...	NA	137,456	...	NA	46.8
TWA	330,283	308,634	7.0	264,966	240,861	10.0	29,135,415	26,610,425	9.5	55.7	56.2
United	485,747*	458,551	5.7	334,239	312,153	7.1	39,590,104	36,108,512	9.6	54.9	57.5
Western[3]	103,598	26,340	293.3	51,556	13,739	275.3	5,455,722	1,407,673	287.6	58.3	58.7
TOTALS	3,122,424	2,843,425	9.8	1,906,227	1,656,530	15.7	211,870,002	187,237,417	13.2	51.5	55.4
INTERNATIONAL											
American	11,181	11,342	—1.4	9,277	8,493	9.2	1,274,123	1,114,317	14.3	69.9	69.4
Braniff	2,771	2,844	—2.6	6,064	5,719	6.0	794,090	754,992	5.2	54.9	38.4
Delta	5,663	5,224	8.4	6,475	5,446	18.9	773,677	622,564	24.3	59.2	47.6
Eastern	23,415	18,315	27.8	31,670	25,091	26.2	3,427,624	2,877,342	19.1	59.9	62.7
National	9,691	11,976	—19.1	6,340	7,266	—12.7	704,222	792,413	—11.1	53.0	74.7
Northwest	8,212	7,323	12.1	18,076	15,243	18.6	3,437,615	3,310,639	3.8	60.3	64.6
Hawaii	1,433	NA	...	3,838	NA	...	424,004	NA	...	64.1	NA
Panagra	11,464	11,112	3.2	14,048	12,803	9.7	1,822,823	1,767,579	3.1	57.4	55.6
Pan. Am.											
Lat. Am.	108,852*	99,296	9.6	101,307	88,735	14.2	13,619,405	12,142,980	12.2	62.1	60.6
Atlantic	58,747	59,382	—1.1	78,518	74,805	5.0	11,561,167	10,596,135	9.1	56.3	58.4
Pacific (Seattle/ Portland-Honolulu)	20,524	20,038	2.4	76,183	56,489	34.9	10,575,023	7,916,719	33.6	63.2	60.4
Alaska	2,210	NA	...	6,406	NA	...	679,536	NA	...	55.8	NA
TWA	4,437	4,510	—1.6	5,047	5,054	—0.1	719,521	769,611	—6.5	43.7	45.1
United	12,765	12,551	1.7	33,563	34,812	—3.6	5,083,753	5,049,400	0.6	63.8	64.9
	6,403*	6,919	—7.5	15,897	17,315	—8.2	1,768,460	1,922,063	—8.0	40.2	67.2
TOTALS	284,125	270,832	4.9	402,465	357,271	12.6	55,561,503	49,636,754	11.9	59.9	60.2
LOCAL SERVICE											
Allegheny	26,393	22,990	14.8	4,477	3,751	19.4	459,844	378,318	21.5	39.4	42.5
Bonanza	10,982	9,343	17.5	2,496	1,988	25.6	252,042	199,588	26.3	45.2	35.6
Central	6,776	7,306	—7.3	1,407	1,248	12.7	146,156	130,010	12.4	24.9	25.8
Frontier	15,871	14,445	9.9	4,618	4,491	2.8	513,289	501,336	2.4	55.5	57.8
Lake Central	10,604	8,937	18.7	1,726	1,406	22.8	179,024	141,335	26.7	38.9	32.6
Mohawk	28,324	21,983	28.8	5,329	3,934	35.5	537,118	391,570	37.2	49.4	52.5
N. Central	46,725	37,294	25.3	7,350	5,563	32.1	752,111	577,394	30.3	46.3	42.2
Ozark	25,356	22,164	14.4	3,889	3,306	17.6	406,915	333,161	22.1	37.8	34.2
Piedmont	26,006	26,451	—1.7	5,481	5,184	5.7	558,277	531,026	5.1	47.4	46.0
Southern	16,023	13,842	15.8	2,808	2,499	12.4	287,863	255,904	12.5	40.4	39.2
Southwest	23,532	18,795	25.2	5,101	3,870	31.8	506,865	391,780	29.4	45.7	47.3
Trans-Texas	17,402	14,348	21.3	3,994	3,299	21.1	423,078	348,498	21.4	36.3	35.2
West Coast	16,516	14,983	10.2	2,959	2,735	8.1	291,640	268,198	8.7	39.5	49.1
TOTALS	270,510	232,881	16.2	51,635	43,274	19.3	5,314,222	4,448,118	19.5	47.4	42.4
HELICOPTER SERVICE											
HAS	1,043*	.....	...	17	.....	...	3,944	2,112	86.7	34.2	39.8
Los Angeles	2,080	732	184.2	83	30	176.7	14,275	7,140	99.9	50.2	40.1
N. Y. Airways	3,960	2,221	78.3	76	42	81.0	9,842	6,758	45.6	39.7	53.3

[1] Number of Revenue Passenger *Originations*. This reflects an unduplicated count of passengers originating journey on the lines of each reporting entity.
[2] Number of Revenue Passengers *Carried*. This represents an unduplicated count of revenue passengers for each operation. Transfer passengers between separate operating units were eliminated, but layover passengers were included.
[3] 1956 figures for Western Airlines reflect 74-day strike. Carrier resumed operations March 24, 1956.
* Represents enplanement passengers, a count of the total number of passengers boarding aircraft. Count is measured on basis of standard number of passenger enplanements per on-line originating passenger. Carrier did not report originations.

AA orders simulators from Curtiss-Wright

American Airlines has terminated an earlier agreement with Erco Division, ACF Industries, Inc., and will procure electronic flight simulators for its Lockheed Electras and Boeing 707s from Electronics Division, Curtiss-Wright Corp.

AA-Erco deal was scrapped by mutual consent, according to ACF president James F. Clark, when it was felt that military simulator commitments would delay delivery of the Electra and 707 units to American beyond expected receipt of the actual aircraft.

In another negotiation, American increased its investment in airborne weather radar to more than $2 million by a decision to equip all present DC-6 series aircraft.

Under a contract signed with Radio Corp. of America, American will enlarge its number of radar-fitted aircraft to 145 by 1958. In addition, Electra turboprops and 707 jets will be equipped with radar on delivery.

AMERICAN AVIATION

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OTHER PUBLICATIONS AND SERVICES . . . American Aviation Daily: Daily News service for the entire industry, $200 per year. Managing Editor—Keith Saunders. **American Aviation World-Wide Directory:** Twice-yearly listing of products, people and organizations, $9.00 each (U.S.A. and Canada); $10.00 each Overseas. Managing Editor—Marion E. Grambow. **Official Airline Guide:** Monthly publication of airline schedules, fares. World-Wide Edition: $19.50 per year, everywhere. North American Edition: $13.50 per year in U.S.A. $14.00 in Canada; $15.00 elsewhere. Published from 139 N. Clark St., Chicago 2, Ill. Phone: Central 6-5804. Managing Director—Robert R. Parrish. **Missiles and Rockets:** Magazine of World Astronautics. For those in missiles and rocket industry and satellite science. $8.00 for 1 year; $12.00 for 2 years (U.S.A. and Canada); Overseas—$9.00 for 1 year; $14.00 for 2 years. Managing Editor—Erik Bergaust. **Air Traffic News (Incorporating Air Traffic Digest)** Daily rates and tariff news, $200 per year; Managing Editor—Mary Miller. **Airports:** Weekly newsletter for airport officials, suppliers and services. Air mailed every Friday, $25 per year. Managing Editor—Wallace I. Longstreth. **Air Information Division,** 595 Broad Avenue, Ridgefield, N. J. Phone: Whitney 5-8850. Director—Edward H. Henkler. **Who's Who in World Aviation:** First Edition over 2,000 biographies of aviation's leaders, 345 pp. Deluxe bound, $10.00 per copy, postpaid. **Aircraft Year Book, Aviation Facts and Figures** (Official Publications of Aircraft Industries Association).

TRANSPORT COMMENTARY

How rumors get started around hangars

by Eric Bramley

Big rumor got started around Pan American World Airways' hangars at Miami International Airport that the company had taken delivery on a jet transport. Scuttlebutt was that flight tests were about to start. Sure enough, parked next to a fence was a plane with no props and two "jet intakes." No one bothered to explain why there were only two jets, when PAA has ordered four-jet transports. Anyway, the rumor blew up when it was discovered that the plane was an old Convair from which the engines had been stripped. Cowling was still in place and, as you can see from the picture, the Convair sure looks like a jet.

* * *

At this writing, there's little hope that domestic airlines will be able to reach agreement on a no-show penalty when Air Traffic Conference meets on April 10 in New Orleans. Industry seems to remain widely split. Making things tougher is the fact that a unanimous vote is now necessary to adopt a penalty. At the last meeting in January, only a three-quarters vote was needed, under rules in effect at that time, and no agreement was reached. Some industry observers predict that not only will a penalty system fail to be adopted, but the Minimum Time Limit plan will be dropped.

* * *

This is a salute to two hard-working airline guys who have done the industry a lot of good. A couple of years ago, Howie Brooks, Pan American's manager of postal service, and Ben Sherwood, American's director of mail and express, started to work on a "mail clinic." This was a program they would present to business organizations, office managers, etc., to show them how to cut mailing waste to a minimum through better understanding of the use and mis-use of the various postal services. Naturally they promote air mail where possible, but this is not the primary purpose of the clinic. During the past 18 months, they've made their presentation at luncheons and evening meetings to several thousand businessmen and members of the National Office Management Association. Post Office officials have endorsed the program. Brooks and Sherwood are goodwill ambassadors as well as good salesmen.

* * *

Operators of ground transportation to and from airports are going to have their work cut out for them when the jets are put into service. Airlines have pointed out to these operators that in 1956 at New York the average peak at 5 p.m. approximated 345 passengers, or 11 buses. In 1961, they estimate that, on the present basis of about 30% of passengers utilizing common carrier ground transportation, there will be 705 passengers requiring 24 coaches. At Chicago's O'Hare Field, the 1956 peak at 5 p.m. produced 200 passengers, or seven coaches. In 1961, with 50% of the people using ground transportation, there will be 1,960 passengers at 5 p.m., or 62 coaches. New York and Chicago operators are confident they'll be able to handle the traffic.

* * *

Northeast Airlines plans a stepped-up advertising campaign to push its Florida service. Plans include a more aggressive newspaper advertising program, a saturation campaign on radio, addition of TV spots and use of billboards. Use of direct mail will also increase, with mailings to travel agents, reservationists, etc. Secretaries in New York and Boston will receive letters in shorthand, urging them to recommend NEA to their bosses and to take a "Cinderella package" vacation themselves.

* * *

Baggage is now being delivered from plane to passengers in an average of 6.5 minutes at Washington National Airport, according to Benny Griffin, airport director. Installation of the new self-claim baggage room at the South end of the building is responsible for the improvement. The 6.5 minutes is the average. At peak periods there may still be delays at the North baggage room, where slow, old-fashioned elevators bring bags up from ramp level.

Sales, Traffic, Promotion

United Aircraft Corp. is conducting a big advertising campaign again this year promoting air travel. Series of five ads will appear in four major magazines. Theme is "Fly, Family, Fly." Each ad will reach an estimated 28.5 million people. Airlines will be supplied with poster-sized reproductions for display purposes . . .

Damaged bags are being routed around **TWA's** central region stations as a reminder to agents to handle baggage carefully. The bags, which have been replaced by the company's customer relations department, are painted bright yellow with red arrows highlighting the damaged areas . . .

Northwest Airlines has instituted a new round-trip "first-rider" fare between Twin Cities and Rochester, Minn. Round-trip must be made within 24 hours. Fare is $6, a 40% discount from the regular $10 first-class round-trip tariff. Flying time between the two points is 36 minutes. Gordon Bain, NWA's vice president-sales, says the purpose of the fare is to permit people who have never been airborne to "take an inexpensive plane trip and learn for themselves the advantages of air travel" . . . NWA and Northern Consolidated Airlines are promoting a nine-day fishing trip to Alaska. Price is $659.88 from Minneapolis . . .

Sabena Belgina World Airlines has published a new handbook of favorite tours, "Holiday Abroad, 1957." It's a 144-page volume with plastic comb binder and four-color cover. Contains more than 80 itineraries, 200 maps and drawings. There's information on passports, visas, currency, car rental, etc. Available at $1 per copy from local Sabena office, or from Sabena, PO Box 180, New York 16, N.Y. . . .

TWA has removed timetables from its flight packets A small supply will be carried on each plane, and new flight packet cover will state, "If you desire a timetable, request it from the hostess." All planes will continue to carry *Official Airline Guide* . . . TWA will alter the rear compartment on its Super G Connies to make it roomier and more comfortable. Seats will be reduced from 11 to nine. New arrangement calls for removal of aisle seats on the right side and installation of wider seats . . .

American Airlines has added a third daily New York-Los Angeles all-cargo DC-6A schedule. This boosts AA's transcontinental all-cargo service to 32 flights weekly with lift capacity of more than 300,000 pounds daily. Counting space available on combination aircraft, AA's capacity tops one million lbs. daily . . .

Air France will call its Lockheed 1649A the "Super Starliner." First one enters service on the Atlantic in August. Meanwhile, a new TWA direct-mail piece highlights the name "Jetstream" for the same plane, which starts service in July . . .

Pan American World Airways is scheduling 154 flights a week in both directions between the U.S. and Europe for the period June 1 to October 15. It will provide a record 200,340 seats during that period . . .

Delta and **Cubana** are cooperating in promoting San Juan-Havana service via Delta, with connection to Mexico City on Cubana. Ads in Puerto Rico Spanish language newspapers will feature night stopovers in Havana . . . Hertz Corp. reports that in the last three years it has increased car rental facilities at airports from 163 to 274 . . .

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TRANSPORT TRENDS

Pressure for airways user charges is increasing in Congress. At House Appropriations Committee's closed-door hearings on CAA's fiscal 1958 budget, congressmen of both parties urged Commerce Dept. to hurry completion of user charge recommendations. Commerce's plan has been to submit proposals for airways and waterways in one package, probably late this year. Congressional prodding could speed up the timetable.

Look for TWA to become holder of the largest order for a single model jet transport. American and United are now tied for the top spot (30 planes each) but TWA will up its Boeing 707 total to 33. It has announced only eight. TWA, with 30 Convair 880s and 33 707s, will also take over first place from Pan American in total straight jets bought by a single carrier. PAA's total is 48 (25 DC-8s and 23 707s).

Domestic airlines face the threat of an enforced fare reduction in the fall—despite the fact that the General Passenger Fare Investigation won't be completed for about two more years. Threat stems from wording of CAB's order suspending 6% fare increases planned by seven trunks on April 1. Suspended tariffs must be ruled on within 180 days. CAB says its ruling could embrace reductions in existing fares.

If the Board forced a cut in the seven lines' fares, remainder of industry would be forced for competitive reasons to meet the reduction. Airlines are urging CAB to give a "yes or no" answer on the suspended tariffs and not to rule on existing fares until completion of the general fare investigation.

A new type of route authorization for local service lines may result from CAB's Seven States Area Investigation, a pending major route case. For the first time, CAB's staff supports an "area type" certificate for a local. This would mean that once a carrier has served the stops on its route with two flights daily, it could operate any flights above that number on a nonstop basis between any points. Initial CAB staff suggestion would apply to Frontier Airlines.

Now that the Senate has confirmed Louis J. Hector as the new CAB member, the Board's make-up will remain constant through 1958, barring voluntary resignations. Next membership expiration is that of Vice Chairman Chan Gurney on Dec. 31, 1958.

Manufacturers competing to sell off-the-shelf utility jets to the military are simultaneously seeking CAA certification of their models. Result: the agency's certification backlog has been pushed to a record peak. Most recent addition, McDonnell Aircraft's Model 119, raises to four the number of utility jets. Others are Lockheed GL-135, North American NA-246, Fairchild M-185. CAA jet and turboprop project list now totals 25—14 in U.S., 11 abroad. Foreign planes include nine turboprops and two jets. Three are slated for approval this year, four in 1958, balance in 1959 and 1960. U.S. entries include 12 jets, only two turboprops, but all to be ready for certification in 1958 and 1959.

INDUSTRY

IATA airlines, caught in inflation squeeze, seek 5% transatlantic fare increase beginning May 1

Members of the International Air Transport Assn. who fly the North Atlantic have asked their governments for permission to add an emergency 5% surcharge to normal transatlantic passenger fares beginning May 1 to enable them to meet what is described as "a critical inflationary situation." A similar surcharge on airline fares within Europe is being considered for the same reasons.

Sir William P. Hildred, Director General of IATA, said that the airlines consider this surcharge to be vitally necessary to avoid a serious financial emergency caused by substantial increases in operating costs since fare levels were last considered in the traffic conferences in May, 1956. He added:

"The price of fuel, which represents almost one-fifth of operating expenditure, has risen sharply since January, as much as 10% in some cases. Spelled out, it will mean a cost increase of $3 million to one airline alone this year.

"There has also been a marked rise in wages and salaries. Flight crew, whose pay represents another one-tenth of operating cost, have had increases of as much as 8% and the trend has been similar for other types of personnel. Individual airlines have reported increases of from 5 to 9% in overall personnel costs since this time last year.

"Prices of equipment, spare parts and accessories, have also shown a recent upward spurt. The cost of some parts has actually increased as much as 20 to 30%."

The Suez crisis was the last straw, Sir William declared. It had simultaneously forced up fuel bills and for a time cut revenues, but is only partially responsible for the airlines' present plight.

"For ten years during which most other prices, including those of other transport and communications services, have risen" Sir William said, "we have managed to withstand inflation by improving operative efficiency and by keeping fares down to attract an expanding market. This time, however, inflation has finally caught up with us. We simply cannot afford another 12 months of financial bleeding."

Two-millionth tourist reported by IATA

The two-millionth tourist passenger on the North Atlantic services of International Air Transport Association airlines was carried last month, according to IATA statisticians. This milestone was reached just 56 days short of five years from the start of international tourist service by the scheduled airlines.

Tourist services went into effect over the North Atlantic on May 1, 1952, and have since spread to virtually all major international air routes. IATA estimated that by April 30 upwards of 2,050,000 tourist passengers and 1,050,000 first-class passengers will have flown the North Atlantic on approximately 83,000 flights during the five-year period.

Kellett gets Army contract for two-man copter

Kellett Aircraft Corp. has received a design study contract from Army for a two-man observation helicopter which will be "newer, better, cheaper and more stable."

The Kellett study is reported to be one of five to be ordered by the Transportation Corps during the next few weeks. Army is looking for a helicopter which will be sufficiently cheaper from the standpoint of initial cost and maintenance to justify replacement of its current models.

ODM to approve fast tax writeoff for facilities

Office of Defense Mobilization has announced that it will authorize fast tax amortization for construction of facilities which are for production of military-value goods exclusively. The same rule will apply to facilities designed for production for the Atomic Energy Commission.

The fast writeoff program is designed to encourage construction of facilities for production of defense-related items. The government allows a company to depreciate for tax purposes all or part of the cost of a new facility in five years.

First Lacrosse missile off production line

The first Army Lacrosse surface-to-surface missile has come off the production line at The Martin Co.'s temporary facilities at Orlando, Fla. Deliveries are expected to be made to the field this summer, according to a Martin-Army announcement.

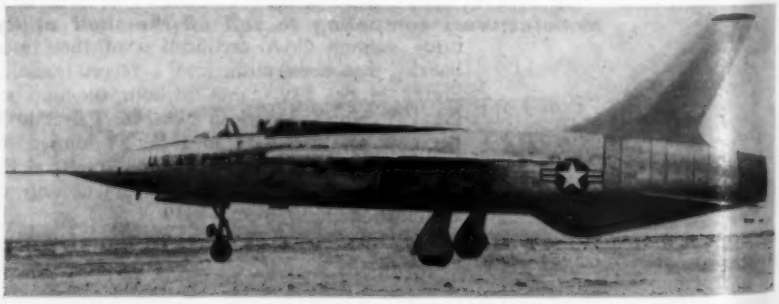
Lacrosse is a highly mobile and accurate missile that can be fired from a standard Army truck. It is propelled by a solid-fuel rocket motor and will be used to supplement air or artillery weapons.

Temco to step up work in electronics, missiles

Temco Aircraft Corp. will increase its electronic and missile activities to account for 50% of total business during the next five years. The company's Garland plant will be assigned chief responsibility for missile and target drone production.

The five-year plan calls for maintaining present subcontracting and overhaul activities on or above current levels.

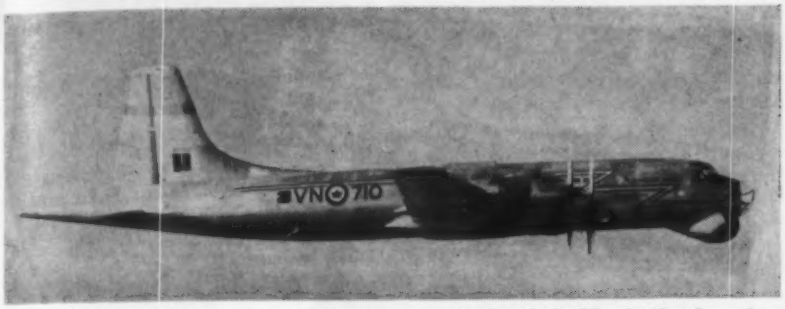
The plan also calls for reorganizing Temco on a three-division basis—Dallas, aircraft; Garland, missiles and electronics, and Greenville, modification and overhaul.



Thunderchief: AF's latest fighter-H-bomber

ARTIST'S RETOUCHING hides details of vertical fin, intakes, exhaust and landing-gear fairings of supersonic Republic F-105 fighter-bomber now entering production. Thunderchief features long fuselage; short swept, very thin wings; needle nose and ventral fin at bottom of aft fuselage. Powerplant is Pratt & Whitney Aircraft J75.

Canadian patrol bomber makes first flight



CANADAIR'S CL-28 Argus patrol bomber made its first flight March 28—three days ahead of schedule. Deliveries to the RCAF will start in the fall.

CAB to 're-examine and re-evaluate' mail pay and subsidies paid to PAA since 1946

Civil Aeronautics Board has ordered a "re-examination and re-evaluation" of mail pay and subsidies paid Pan American World Airways for periods dating back to 1946. Board said its action stems from the extensive audit of transactions between PAA and its various affiliates which earlier last month led to a general investigation of the relationships between PAA and the affiliates. (AMERICAN AVIATION, Mar. 25). The two cases are separate.

CAB said its initial audit, covering the year 1954, "revealed, for the first time, many practices of Pan American which require scrutiny . . . Much of the newly-developed information has most serious implications concerning the reasonableness of the mail rates established for the carrier, not only for the year 1954, but for the years 1946-53."

CAB said specific items of information available indicate "that for the 1946-53 period alone, Pan American's properly recognizable expense, which was underwritten with subsidy, may have been overstated by as much as $6.5 million . . ."

Noting that its duty is "plainly evident," CAB commented as follows on some of its audit findings:

"—Pan American has failed to charge Uraba, Medellin and Central Airways . . . proper costs for aircraft leased to it by Pan American . . . resulting in apparent undercharges for aircraft rentals of $270,000 during the period 1946-53; and

"—Pan American has absorbed ground service costs of UMCA at Tocumen Airport, Panama, amounting to about $246,000 in the period 1950-53, and $99,000 in 1954, contrary to appropriate principles of allocation and contrary to the terms of an agreement filed with the Board . . .; and

"—Pan American has failed to bill outside companies, including affiliates, and contrary to appropriate principles of allocation and agreements therefor, with proper charges and rates for airport services it renders such companies at a number of airports in Central and South America, and, thus has absorbed $4.1 million of costs in the period 1946-53, which should have been charged to the other companies in accordance with said agreements . . ."

Other items listed by the Board involved specific amounts of $595,000, $280,000, $66,000, $214,000, and $1,145,000.

"As a result of these various matters," the agency continued, "it appears that Pan American's subsidy needs may have been substantially overstated, and that completion of the audit may disclose other discrepancies requiring further exploration on the Board's part."

CAB indicated it will issue a further order "defining the specific issues to be resolved."

Board emphasized the possibility that "information now available may be subject to substantial qualification." Also, that some items may have been taken care of in appropriate past mail rate cases and that "Pan American is yet to be heard in connection with all of these matters."

L. B. Smith to increase gross weight of C-46

L. B. Smith Aircraft Corp. is instrumenting a C-46 airplane in preparation for flight tests aimed at increasing the gross weight of its C-46/CW20-T to about 50,000 lbs. gross.

The new program was announced immediately following disclosure by Riddle Airlines of its C-46 authorized for a 49,900 lb. gross. (See story p. 89.)

LBS officials said certification at the new weight would be sought and approval obtained within the next three to six months. Company indicated some 12 C-46/CW20-Ts are now in operation, seven are undergoing remanufacture and several others are on order.

New gross, when approved, would be offered to present users with only few changes anticipated.

TWA cutting down 10% on administrative staff

Trans World Airlines has entered the final stages of a readjustment of administrative personnel aimed at cutting an estimated 10% of the carrier's list of 19,945 employes.

The "streamlining" of administrative staffs will not affect TWA flight or maintenance personnel, officials said.

TWA president Carter L. Burgess attributed the need for the cutback to an imbalance between the carrier's payroll increases and relative revenue gains over the past two years. Burgess pointed out that, in this period, revenues have increased 17%, whereas payroll costs have gone up 31%.

Navy decides against FTL data-link system

Recent declassification of the Tacan data-link system developed by Federal Telecommunication Laboratories under Navy Bureau of Aeronautics sponsorship is tied to the Navy's decision not to adopt the FTL link for operational use.

Latest information from a Navy source is that the Navy has no plans to buy any more of the experimental FTL equipment nor any plans for future production.

Three different data-link systems have been under development by Bell Telephone Laboratories, Inc., General Electric Co. and FTL. Recently the Air Force reportedly adopted the Bell system for use with components of the continental air defense system requiring a data-link tie-in.

Necessity for coordinated use of the air defense components by Air Force and Navy in air defense planning required a common data-link system. Air Force found the Bell system best suited to the job and Navy is therefore planning implementation of that system for its operations.

The Bell data-link is believed to be a type that is integrated with communication channels rather than the navigation channels as is the FTL system.

ATA elects Seybold, Turner vice presidents

Leo Seybold has been elected vice president—federal affairs and Robert L. Turner vice president—traffic of the Air Transport Assn.

Seybold, former assistant director of public relations for United Air Lines, joined ATA Feb. 15 as director of federal affairs. Turner came to ATA March 4 after serving for several years as vice president—sales for Northeast Airlines.

The board also elected Hawaiian Airlines, Ltd. to associated membership.

Local, territorial airlines form new association

Six local service airlines and two territorial carriers have formed a new organization, the Association of Local and Territorial Airlines, and are seeking an executive director.

The new group has retained former CAB Member Joseph P. Adams as counsel. He will serve as acting head of ALTA until an executive director is hired. The law office which Adams will open in Washington, D.C., will be used as headquarters until other space is secured.

ALTA members are Bonanza, West Coast, Central, Lake Central, Ozark, Frontier, Trans-Pacific and Reeve Aleutian Airways. The six locals resigned recently from the Conference of Local Airlines because of basic differences over how the organization should operate. The Conference is continuing with seven members — Allegheny, Mohawk, Piedmont, Southern, Trans-Texas, Southwest and North Central.

Trans-Pacific operates in Hawaii; Reeve is an Alaskan carrier. An ALTA spokesman said it is hoped that several more territorial carriers will join later.

Nick Bez, president of West Coast, was elected chairman of ALTA's board, with Gwin Hicks, president of Lake Central, as vice chairman.

Louis Leverone dead

Louis Edward Leverone, 76, board chairman of Frontier Airlines and board chairman and president of Nationwide Food Service, died last month in Chicago. Leverone was a past president (1949-51) of National Aeronautic Association, had served as chairman of the Wright, Collier and Brewer trophy committees, was a member of the board of governors of the National Air Council, and had been a member of the Illinois Aeronautics Commission.

BRIEFS

Manufacturing-Military

U.S. aviation exports in 1956 passed the $1 billion mark for the first time since 1946. Total exports were $1,044,487,000 compared to $728,514,000 in 1955, an increase of 43%. This is greatest growth in exports ever registered, according to Aircraft Industries Association.

Cohu Electronics, Inc., has been formed by LaMotte T. Cohu, president, and his associates at Kay Lab, San Diego. Corporation will provide financial and business management for electronics manufacturing and development companies.

Autonetics Division of North American Aviation has received Air Force and Navy orders totaling more than $4 million for NADAR electromechanical magnetic tape recorder-reproducer systems.

Cessna Aircraft Co. has set a guaranteed price of $370,000 for the four-engine pressurized Model 620. Radio and other optional equipment is extra. Production is slated for March, 1958, delivery the following June.

Servel, Inc., Evansville, Ind., has reversed its offer to sell its Defense Division and is looking for orders to utilize the plant. Division manufactures machine parts and assemblies.

Airborne Instruments Laboratory, Inc., and **Aircraft Radio Corp.** have discontinued merger discussions. Companies said that it became apparent to both that no benefit would be realized in the move.

Convair is expected to switch some of the B-58 Hustler flight test program to Kirtland Air Force Base, N. M. this month. About 200 Convair employes will be stationed there by year's end, 300 by end of 1958.

Transport

Northeast Airlines shareholders voted an increase in stock from two to three million shares at their annual meeting in Boston. No specific plans for issuing the increased stock have been made yet, according to NEA President George E. Gardner.

David Proudlove, currently British Civil Air Attache in Washington, is to head up a new subsidiary Bristol Aeroplane Co. is setting up in the U.S. The new company will have responsibility for sales and servicing of the Britannia and other Bristol products in the U.S., with headquarters in New York. Proudlove will be president and a director of the U.S. subsidiary, the Bristol Aeroplane Company (U.S.A.) Inc. W. S. Haggett, a director of The Bristol Aeroplane Company of Canada (1956) Ltd., will head the company until Proudlove's release as air attache this summer.

Continental Air Lines reports negotiations almost completed with The Chase Manhattan Bank on a $25-million credit arrangement to finance purchase of 15 Vickers Viscounts, four Boeing 707s and five Douglas DC-7Bs. Continental is also talking financing of Los Angeles maintenance base.

Delta Air Lines has purchased five C-46s from Civil Air Transport. Aircraft will be used for all cargo operations, replacing C-47s by mid-year.

Port of New York Authority revealed that its investment in four airports and one heliport total $153 million. Of this $33.2 million was expended in 1957. Budget for 1958 is $90.9 million.

American Airlines has received National Safety Council Award of Honor for outstanding employe safety performance in 1956. There were 7.2 disabling injuries per million manhours in 1956, half entire industry rate of 14.41 for years 1953-55.

FINANCIAL

Republic Aviation Corp reports 1956 net earnings at $7,367,435 on sales of $346,214,310. Backlog at the end of the year was $226,000,000.

Temco Aircraft Corp. reports all-time high in sales of $90.3 million in 1956. Backlog of orders nearly doubled over the previous year, reaching about $180 million. Sales the year before were $78,244,390 and backlog was $96 million.

Northrop Aircraft, Inc. sales dipped for the second quarter of the fiscal year. Sales were $61,981,421 compared to $71,308,512 for the same quarter in the previous year. Earnings were $1,100,068 compared to $1,372,111 a year earlier.

Texas Instruments, Inc. realized sales of $45,699,358 for 1956, a rise of 59% over 1955. Net profit amounted to $2,349,103 compared to $1,581,790 in 1955.

The Martin Co. sales for 1956 were $358,961,622 compared with $271,862,342 in 1955. Earnings were $10,839,656 down from 1955's $13,285,297. Martin's backlog at year's end was a record $810 million.

Lockheed Aircraft Corp. reports record sales of $742,591,000 for 1956 compared to $673,589,000 in 1955. Earnings were $15,073,000, down from $17,332,000 the year before. Missiles accounted for $52,700,000 of Lockheed's 1956 sales.

Bell Aircraft Corp. totaled sales of $216,033,290 during 1956, a peak for peacetime years. Income amounted to $5,761,103 compared to 1955's $5,914,482.

Servomechanisms, Inc., reports 1956 net profits of $615,606, a 40% gain over the previous year. Net sales were $18,138,280, compared to 1955's $12,412,756.

Northwest Airlines netted $3,225,595 in 1956 compared with $2,116,180 in 1955. Operating revenues reached a record high of $76,672,482, $60 million coming from passenger business.

Minneapolis-Honeywell Regulator Co. has received a $15,516,675 Air Force contract to supply a new flight control system for the McDonnell F-101B supersonic interceptor. System, tabbed MB-5, was developed by Honeywell under $4.8 million program with McDonnell.

Continental Air Lines reports a net income of $710,426 for 1956, up from $395,564 in 1955. Operating revenues were $18,548,127 compared to 1955's $16,082,839.

Trans World Airlines, Inc., reports a loss of $2,227,000 for 1956 on operating revenues of $240,394,000. In 1955 TWA made a profit of $5,407,000 on revenues totaling $217,431,000.

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A relentless scientific quest is underway today in the secrecy of America's laboratories and proving grounds. The object: to enable missiles to safely "reenter" the earth's atmosphere before searing supersonic heats reduce them to dust. The problem is doubly important—while missiles serve America's defense today, their real future might well be to serve man peacefully—as super-fast mail carriers, for instance, that span continents and circle the globe in minutes.

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INTERNATIONAL AVIATION

by Anthony Vandyk

REAL's turboprop re-engining is significant

The decision of Brazil's REAL airline to re-engine some of its Convair 340s with the Napier Eland turboprop is of major significance to aviation as a whole. In the past there have been very few instances of commercial operators changing the engine model in their equipment after delivery.

To switch from one type of powerplant to another is a major move involving much time and not a little money. The fact that the Brazilian airline has taken the plunge will cause many other operators to re-examine the advantages to be gained from putting a turboprop into an airframe designed for piston engines.

Re-engining with turboprops is, of course, no novelty to the U.S. Air Force and U.S. Navy. Experimental turboprop versions of the Stratocruiser, Super Constellation and Convair 340 have been flying for some time in military service. These aircraft, however, were converted as much to serve as flying testbeds for the turboprop engines that power them as to gain experience in turboprop operations for the USAF and Navy.

In Europe, too, there have been experimental turboprop-powered versions of existing transports flying for many years. A Dart-powered DC-3 owned by Rolls-Royce still gives pilots a scare when it is encountered at upward of 20,000 ft.!

Like the military turboprop aircraft of the U.S., most of the British versions were made to gain flying hours for the engine rather than to demonstrate the advantages of the turboprop in the particular airframe.

Napier has had problem

The only company that has had a serious program to re-engine commercial transports with turboprops is D. Napier & Son. This company bought a Convair 340 and re-engined it with the Eland. It has made detailed studies for the re-engining of various other current American transports including the Constellation and the DC-6 series.

Salesmen from Napier have paid extensive visits to the various airlines of the world operating Constellations, DC-6s and Convairs to persuade them to re-engine.

The breakthrough finally came last month with the REAL decision. The Brazilian aircraft will be fitted with the British engine in the U.S. (by PacAero Engineering Corp. at Santa Monica, Calif.). The prototype Eland 340—the one owned by D. Napier & Son—will be flown to the U.S. this summer for CAA certification. PacAero will act as Napier's agent for the certification program.

Napier's success in persuading REAL to re-engine is likely to be followed by renewed sales activity on the part of other manufacturers. Allison has had a T56-powered Convair flying for many years but to date has made no strong sales effort to persuade commercial operators of this equipment to re-engine.

Other projects recalled

Rolls-Royce has had various projects for re-engining the Douglas DC-6 and DC-7 series aircraft with either the Dart or the Tyne. At one time there was also a scheme to put four Darts in a Convair 340 airframe.

In 1953 Pratt & Whitney and Lockheed seriously talked about putting a commercial T34 in the Super Constellation for airline use, but since then little has been heard from Hartford on this.

What does the turboprop do for aircraft like the Convair 340 and Constellation? It reduces operating cost, boosts speed, increases range and improves work capacity. And, even more important, it extends a useful life of airframes which, because of their piston engines, may soon be regarded as obsolete.

HEAVILY-RETOUCHED PHOTO of Russia's Ukraina turboprop transport confirms aircraft's similarity to twin-engine Camp. Both were designed by O. K. Antonov. According to official Russian data the Ukraina cruises at 360 mph at altitudes between 24,000 and 30,000 ft. It can carry 85 passengers and 3½ tons of cargo and can operate at passenger-mile cost 30 to 50% lower than piston-engine aircraft.

BRIEFS

ALA, Chilean cut-rate carrier, has arranged to lease an L-49 Constellation from Cubana . . . **British European Airways** plans to start service to Belgrade this summer . . . **Lufthansa** will start service to three new points this spring—Zurich, Vienna and Montevideo . . . **East African Airways** has inaugurated service to Europe (Dar es Salaam-Nairobi-Entebbe-Khartoum-Benghazi-Rome-London) . . . **Trabajos Aereos y Enlaces,** new Spanish independent, is to operate a fleet of 15 aircraft—Scottish Aviation Twin Pioneers and Hunting-Percival Presidents.

Aviateca will start service from Guatelama City, its home base, to Miami on April 26, using DC-4 equipment chartered from Taca International Airlines . . . **KLM** will start service to Basle, Switzerland, this spring . . . **Air France** has started service to Rangoon, Burma . . . **Trans-Australia Airlines** has taken delivery of its eleventh Viscount. Two more are due for delivery in 1958 . . . **Iberia** will start operations with Convair 440 equipment this summer.

Bristol Bobbin is the name of a recoverable supersonic "dart" used for the development of a recoverable missile/-test vehicle required for the company's Thor ramjet project. Initial deceleration from supersonic speed is by six ribbon parachutes which later jettison when main 30-ft. canopy opens. Landing is on a nose spike . . . First production **de Havilland** DH 110 Sea Vixen all-weather fighter for the Royal Navy made its initial flight last month.

Switzerland has voted funds to buy 60 Pilatus P.3 trainers, 20 Vampire trainers and eight helicopters (three Djinns, three Alouettes and two U.S. models . . . The **Netherlands** Army will soon be equipped with a U.S.-manufactured missile, probably the Corporal . . . Italy's second **Fiat.** G.91 lightweight fighter will soon be ready for flight test; the first crashed.

PEOPLE

Fred S. Hunter, West Coast Editor of American Aviation (right), has received Strategic Industries Assn.'s only press citation for his "continuous objective reporting of industry news" which has "contributed to understanding and cooperation in defense production over a period of many years." Leo A. Pfankuch (left), SIA president, made presentation at Washington, D. C., ceremony.

TWA officials received a briefing on how Convair 880 would be handled at airports during recent mockup demonstration at Convair-San Diego. Front from left: D. W. Heep, TWA director of terminal service; H. R. Thomas, director of passenger service; K. E. Coughlin, Convair operational and support planning group engineer; G. W. McKenzie, TWA superintendent of corollary equipment engineering. Back row, M. W. Fannon, assistant flight operations director; M. T. Walker, ground support engineer.

Dale A. Lichty moves up to president of Hydro-Aire

Former senior vice president succeeds Homer H. Rhoads, who resigned. Lichty has been with aircraft accessories company 13 years, and has been senior vp and a director of the company since 1955.

American Airlines board elects Shepard Spink vp-merchandising

Former vp and ad director for Crowell-Collier Publishing Co., will head up AA advertising program and coordinate cargo and passenger divisions of sales department in developing merchandising plans.

Former telephone executive assumes Panagra vice presidency

Ludwig H. Clifton, formerly assistant treasurer of General Telephone Corp., has succeeded Kenneth A. Lawder as vp-comptroller of airline. Lawder resigned to become treasurer of W. R. Grace & Co.

Carl B. Wooten becomes executive vp of Trecker Aircraft

Former sales manager of Aero Design & Engineering Co., builders of the Aero Commander, joins Royal Gull manufacturing firm. Wooten has been active in aircraft sales since 1934, particularly in business aviation.

General Precision Equipment Names E. A. Link vice chairman

Founder and chairman of Link Aviation, Inc., subsidiary of GPE, takes over newly-created post and also becomes a member of the corporate executive committee. He is a pioneer in aerial trainers and simulators.

Topp Industries founder becomes president of new division

Herbert J. Petersen, who founded Topp Industries, Inc. in 1951 and is executive vp of the corporation, has been elected president of Topp Manufacturing Co., a new division. Topp now has two divisions, two subsidiaries.

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MANUFACTURING

Name	New Position	Former Position
George H. Kelley	Chief engr., Southwest Airmotive	Plant facilities engr.
Howard Clark	Sr. subcontracts administrator, Temco Aircraft Corp.	With Boeing Airplane Co.
Charles Bodey	Chief engr., Southwestern Industries, Inc.	Asst. to vp-research, Standard Coil Products
Bernard Levine	VP, Norden-Ketay Corp. and gen. mgr., Precision Components Div.	Gen. mgr., Precision Components Div.
Aaron R. Campbell	Supt. electronic and experimental airframe fabrications, Temco Aircraft Corp.	Gen. supv., electronics fabrication
John H. Sidebottom	Dir. sales, Wright Aeronautical Div.	VP, Flight Refueling, Inc.
Alfred Finzel	Project engr., ramjet design, Wright Aeronautical Div.	Chief of structures, Army Ballistic Missile Agency, Redstone Arsenal
H. C. McDaniel	Dir. tech. information, Westinghouse Electric Corp.	Mgr., tech. information
Thomas E. Davis	Nat'l sales mgr., Instrumentation Div., Ampex Corp.	Western reg. sales mgr.
Michael Balog	Gen. mfg. mgr., Semiconductor Div., Sylvania Electric Products Inc.	Plant mgr., Mill Hall, Pa.
Edward W. Allen, Jr.	Mgr. pub. rel., Allen B. DuMont Laboratories	Mgr. publicity and publications
William R. Martin	Chief engr. and product mgr., RF Systems and Components Div., Electronic Specialty Co.	In chg. Radiating Systems Group, Lockheed Aircraft Corp.
Thomas F. Fitzgibbon	Mgr. Hydraulic Div., Parker Aircraft Co.	Chief engr.
O. H. Kehle	Asst. gen. mgr. Adel Precision Products	Chief engr.
William F. Errig	VP, and treas., Wilford Aircraft Corp.	Peco Mfg. Co.
Maurice J. Coughlin	Dir. procurement, Bell Aircraft Corp.	Dir. procurement, Weapon Systems Div.
Ralph J. Halk	Business mgr., Granger Associates	Tech. placement coordinator, Stanford Research Institute
Warren F. Morgan	VP-customer relations, Federal Electric Corp., subsidiary IT&T	Sales mgr.
Clifford Tuttle	Sales mgr., Vitramon, Inc.	With Bridgeport Brass Co.
Jack Southwell	Supt. of Plant One, Tapered Air Products Corp.	Factory supt., McCulloch Motors
Thomas A. Callaghan	Eastern rep., Aero-nutronics Systems, Inc., subsidiary of Ford Motor Co.	Spec. asst. for facilities, Office of Asst. Secy. of The Navy
Lt. Gen Roger M. Ramey	Consultant, Radioplane Co.	Commander of Fifth Air Force
Howard J. McGinn	Retired as chmn. bd., continues as dir., Eaton Mfg. Co.	Bd. chmn. and director
John C. Virden	Chmn. bd. and president, Eaton Mfg. Co.	President
O. A. Wright	Engrg. mgr., Actuation Research Corp.	Staff engr., Lockheed Missile Systems Div.
D. W. Kaufmann	Mgr. mktg, Rem-Cru Titanium, Inc.	Eastern sales mgr.
M. Ross Yeiter	Sales mgr., Special Tube Operations, Sylvania Electric Products Inc.	Product sales specialist
S. H. Fedan	Mgr. of aviation sales, Industrial Sound Control Dept., Koppers Co., Inc.	Dept. mgr., Metal Products Div.
R. C. Berendsen	Mgr. engrg., Missile and Ordnance Systems Dept., General Electric	Mgr. Ordnance Systems Projects
Warren W. Johnston	Mgr. Systems Div. Panellit Service Corp.	Senior engineer
Dr. Donald M. Allison, Jr.	Asst. Mgr. military products, Bendix Radio Division	Asst. to chief engr. radar dept.
Fred Magruder	Mgr. Wichita Plant I subcontract assembly and Liberal, Kans., facility, Beech Aircraft	Asst. mgr. Plant I manufacturing
J. W. Stack	Dir. sales and contracts Milwaukee plants of AC Spark Plug Division	Adv. Mgr. Flint, Mich. plants
John K. Gossland	Executive vp and gen. mgr. Electromation Co., Inc.	Hoffman Laboratories
M. J. Kennedy	Asst. gen. mgr. Skinner division, Bendix Aviation	Management staff
Maurice A. Broner	Mang. Ed. Journal of Astronautics	Sperry Gyroscope Co.
Ernest H. Uim	Gen. sales mgr. Semiconductor Div., Sylvania	Product sales mgr.-electronics
Cmdr. E. T. Uptain (USN Ret.)	Aircraft field tech. specialist, Electric Auto-Lite Co.	U.S. Navy
Thomas L. Douglas	Senior sales engineer Finn Aeronautical Division	Plant mgr. Tolan Machinery Co.

AIRLINE

Capt. Ormand Gove	Dir. flight operations-Atlantic, Trans World Airlines	Captain
Thomas R. Foster	VP, Aero Corporation	Asst. to the president, Southern Airways
Carl H. Horenburger	Dir. employe relations, Seaboard & Western Airlines	Asst. to vp-operations
Jack F. May	Mgr. cargo sales, Eastern Air Lines	VP, Tag Airlines, Inc.
Frank H. Sheldon	Dir. contract sales, Slick Airways	Dir. sales promotion and asst. to the pres., Puerto Rico Tours
Aki Wakasugi	Pub. rel. representative, Japan Air Lines	Sales representative
Richard W. Gilbert	Resigned	Cargo sales mgr., Eastern Air Lines
Robert B. Noble	Regional mgr. of air mail and express, American Airlines	Sr. sales representative, Nashville
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HONORS

Dr. Jerome C. Hunsaker, member and former chairman of the National Advisory Committee for Aeronautics, received the Distinguished Service Medal, the Committee's highest award for "service of fundamental significance to aeronautical science, climaxed by an outstanding and unparalleled record of leadership . . ."

Mrs. Rebecca Hall Sparling, design specialist for Convair Division of General Dynamics Corp., received the 1957 Award for the Society of Women Engineers for significant contribution to engineering. Mrs. Sparling is particularly known for her work in high temperature metallurgy, gas turbine development and nondestructive testing.

William C. Foster, Olin Mathieson exec. vp in charge of high energy fuels activities, received an honorary doctor of laws degree from Syracuse University.

Dr. Walter R. Dornberger, technical consultant for Bell Aircraft's Research Div., has been named chairman of the Spacecraft Systems Subcommittee of the Space Flight Technical Committee of American Rocket Society.

L. J. Brugman, KLM's Senior Captain, has been appointed Commodore, a title and rank unique in the airline's flying corps.

The "President's Award," the highest honor that United Air Lines can pay an employe, was presented to **Capt. R. L. (Rube) Wagner** of Atherton, Calif., for his "outstanding contributions and pioneering efforts in the field of commercial aviation."

H. F. Konig, gen. mgr. of the Light Military Electronic Equipment Dept. of General Electric Co., was named "Industrial Man of the Year" by the Industrial Management Club of Utica.

Richard H. Summerl, electrical design engineer at Douglas Aircraft Co., was elected president of the Aircraft Electrical Society.

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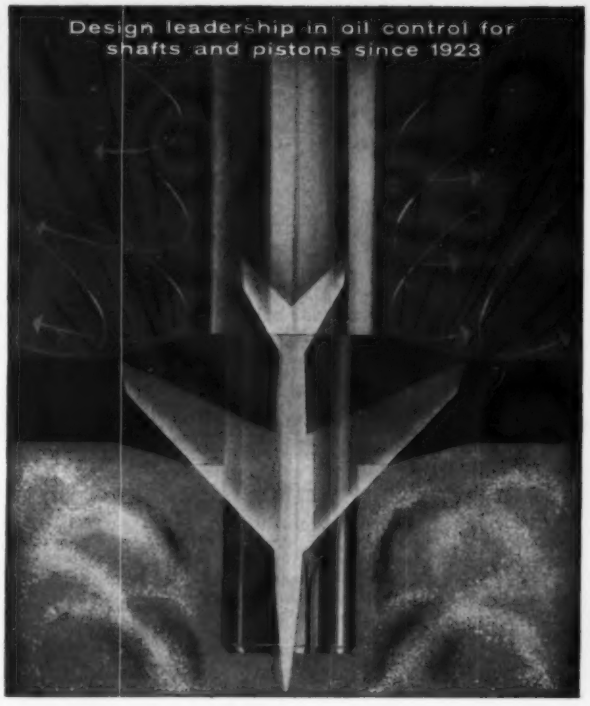

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EN ROUTE

by Wayne W. Parrish

Jottings from A Traveler's Notebook

Last May in London the Napier people—they make aircraft engines among other things—showed me all around their extensive plants and I was considerably impressed. But to do the tour up brown they brought out a 1920 6-cylinder Napier car complete with uniformed chauffeur to take me from plant to plant. (See photo.) Seems that Napier once built the finest motor cars in the world; they think Rolls Royce is nothing but a recent upstart. Despite its 36 years, this old buggy performed fine.

Also on that May trip I went to Derby with some Rolls Royce people and had a thorough tour of the RR aircraft plant. Then I was picked up in a brand new Bentley Model S (made by RR) and driven over some picturesque country to spend the night at the Lion & Swan Hotel at Congleton, one of these fine and very old English inns. James Hay Stevens, AMERICAN AVIATION's London editor, was along.

Next day we went through the Rolls Royce motor car works at Crewe. They don't resemble a streamlined American production-line operation. In fact I never could figure out how they ever put everything together to make a car, but the final product is the best motor car in the world—period. (Special note to GM and its Cadillac.) The new Bentley S and the new Rolls Silver Cloud are identical in every respect except for the radiator grill.

As some of you older readers may remember, I acquired a 1950 Bentley in Paris several years ago and have enjoyed driving it ever since. I'll let you in on a secret—I'm trading it in on a new Bentley S for delivery this spring. When you close a door believe me it's closed. No chrome is used; only real nickel. The design is classic, not glamorous like a 1930 movie palace. Only trouble is that the engine is so quiet you're never sure whether it's on.

And writing of motor cars, I'm also the owner of a new Golden Hawk, the swank powerful little sports car produced by Studebaker. Ever since Roy Hurley and Curtiss-Wright moved into Studebaker-Packard, I'd been warned that I had to have a Golden Hawk. So I have one. I hardly need a 285 h.p. supercharged engine for around-town driving but Hurley is hard to say no to. I will say that this little buggy has tremendous spurt, power, flexibility and maneuverability. If you haven't taken a spin in a Golden Hawk, you should do so. To my mind it's the best of the new American models—and certainly has the smartest designing.

This fellow Hurley is a bug on cars. When he opened that big C-W research place in upper Pennsylvania last August, he took me for a spin in his Mercedes-Benz 300SL sports car. What a buggy! It can make 160 mph top speed without a whimper. Tremendous power. But just where do you drive at 160 mph except on a race track? My idea is that you better watch Hurley and C-W on automobiles. He'll come up with some good ideas, especially with this tie-in with the German Mercedes-Benz.

About Good Hotels

Let me mention some good hotels I've found. Down in Miami Art Bruns is making history with his Miami Springs Hotel and Villas right across from the PAA hangars at Miami's international airport. The hotel is fine, and so are the villas. And Art has made a very smart move by getting the new Miami Wings Club to operate in one of the buildings, a very fine locale and fine club. And when you're down that way you'll keep hearing about how the Smalley brothers are expanding Couture car rental service all over the country; they started on Miami Beach and I won't be surprised to see them in Bangkok and Buenos Aires next.

Out in San Mateo, Calif., there's a spot worth noting. It's the Villa Hotel on El Camino Real, Highway 101, about ten miles south of San Francisco airport. One of the most deluxe and best planned auto motels I've seen, but be sure to get a room off the highway. The Southern Pacific went through my front room all night long but an inside spot is fine, and the layout and facilities are excellent. Limousine service to and from the airport at regular intervals for $1.20.

Incidentally, *Official Airline Guide* now has a section listing hotels, motels and restaurants on or near airports. Use it, and if you have suggestions for new good spots for air travelers, send them along to the *Guide* in Chicago.

Found a wonderful new gimmick in San Mateo. The Benjamin Franklin Hotel, several miles closer to the airport than the Villa Hotel, puts out free hot coffee early every morning not only for its own patrons (including airline crews) who are leaving for the airport, but for limousine customers as well. The limo usually stops long enough for everybody to have a hot cup. Wonderful public relations—wonder why more hotels don't do this.

Another good eating spot is Vol's Restaurant on Highway 66 just outside Amarillo, Texas. Good for steaks. Had a fine lunch there last fall with Capt. W. A. S. Honan, Ken Morgan, first officer, and D. R. Lusk, the station manager, all of Continental Air Lines . . . . and down Miami way I found Leonard's La Pena Restaurant, 7699 Bird Road, near Tropical Park on the south side, very good indeed . . . . and for pure courtesy let me give a bow to Don Pederson, night clerk of the Black Hotel, Oklahoma City, who helped me out of a room-shortage jam during the National Air Races with the greatest politeness and patience I've ever known a hotel man to have.

Finally got around to see the new Houston terminal down in Texas last fall and it's a very impressive place. Seems to be well designed. The air-conditioning wasn't operating so the interior had an awfully pungent stale odor, but that can be remedied and probably has. I stayed in one of the 13 hotel rooms in the terminal, quite okay, but what a shame Houston has so few accommodations. Rooms are filled all the time; they should have at least 50 available. The snack bar service at 5 a.m. could stand improving by about 5,000%.

Sure good to get out into the U.S. and find good people and low prices. Stayed one night at the Northern Hotel in Billings, good room and inexpensive, good coffee shop, and the taxi driver to the airport carries your bags, 50¢ full charge; didn't stick around for (and apparently didn't expect) a tip . . . . And still on Billings, the airport has a good description of the town and the area. Why don't more chambers of commerce or civic clubs put such information in their terminals?

WWP with a 1920 6-cylinder Napier in London.

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